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PAPERS

IN

MECHANICS.

The GOLD MEDAL of the Society was this Session voted to JOHN MILLER, Esq. of Bedford, for his Methods of Raising the Bodies of Persons who have sunk under Water, or of assisting Persons in Danger in Water. The following Communication was received from him; explanatory Engravings are annexed, and Models of the different Implements, with Drawings shewing their mode of Application, are preserved in the Society's Repository.

SIR,

WITNESSING, as many others did, a boy losing his life in the river in this place, for want of an expeditious means of finding and recovering his body when sunk, I wrote to and waited on Dr. Hawes, requesting him to procure for me whatever were the proper and most approved machines for that purpose. He purchased for me two sets of the Royal Humane Society's Apparatus for Reanimation; two of
Daniel's

Daniel's Life Preservers ; one of the Society's Rope Drags ; and one of Dr. Cogan's Pole-Drags ; pointing out this last as the most approved and most efficacious machine then in use : and he gave me a sketch of a bar-drag, armed with tenter-hooks, and weighted with a bar of iron, to which the rope for drawing it was to be fastened.

As soon as I had received it, I went with a medical gentleman, who had been eye-witness to the fatal catastrophe, and who assisted in searching for and taking out the boy, (consequently knew the precise spot wherein he fell, and where he was found, which was within three feet of where he fell) to try the efficacy of Dr. Cogan's drag. The boy fell from off the bridge whilst fishing, and so far distant from the shore as to render a boat necessary for us to reach the spot. The depth of the water was ten feet, and we found a difficulty from the buoyancy of the pole in Dr. Cogan's drag, in forcing it to the bottom, and when we did, the stones, or whatever it met with, so favoured its buoyancy as to toss it up considerably when drawing forwards, and it required the force of both hands to keep it down so as to scrape the bottom with it. The result was, that the force the person holding the drag was obliged to use to counteract the buoyancy of its pole (added to the weight and resistance of the water against it) overpowered the means of the person who had the guidance of the boat, to move it in the direction he wished ; and instead of the movement of the boat directing the drag (or rather the person holding it) the drag, by the force required to keep it at the bottom, and by the weight and resistance of the water acting on its pole, governed the boat, and was as it were an anchor to it, confining the efforts of the person standing in it and using the drag, and making the action of the drag stationary instead of progressive.

The

The extreme scope of this drag not exceeding eighteen inches, may it not require too much time to traverse the uncertain space wherein the object to be searched for lies, to insure its success? The bar-drag, of which Dr. Hawes gave me the sketch, in point of extent and its consequent expedition might answer where the bottom is level, and no ridges or hollows would occur; but, as being a straight piece of wood, it can accommodate itself to no unevennesses, consequently must leave holes, the most likely repository of the object sought for, unsearched.

One cannot but be aware that it will seldom happen that the precise spot can be ascertained, either from the current of the water, the confusion or difference of opinion among spectators, the space to be searched is generally considerable and uncertain. Adverting, therefore, to what Dr. Hawes had sent me, and to the conversation I had with him, as well as the enquiries I had made, I thought something was still wanting; and the desideratum appeared to me to be a machine that would be expeditious, because it was extensive; and secure, because by accommodating itself to the ground, however uneven, it would search holes and hillocks equally. I turned my mind, therefore, to form a machine of this description, and thinking that the buoyancy of the wood would take off from the weight of lead and iron about it, were I to extend it to ten feet in length, I determined on that length for it, and I found my expectation realised in the result. I therefore denominated it a machine or drag, easily drawn by one person, that fishes an extent of ten feet at one sweep, with the certainty of finding a body, if it lies within that space, let the ground be ever so uneven, or the water ever so deep. *Vide Reference and Engravings.*

Permit me, Sir, to request you to submit this account of my machine to the Society of Arts, &c. accompanied with
models

models and a drawing, and should they be honoured with the approbation of the Society, I shall feel myself much gratified, as their sanction could not fail to promote their publicity.

I have the honour to be,

Sir,

Your most obedient servant,

JOHN MILLER.

Bedford, Feb. 28, 1809.

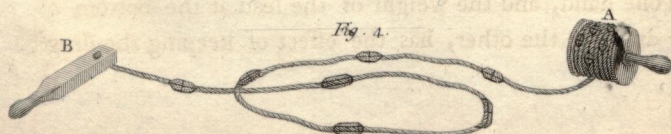
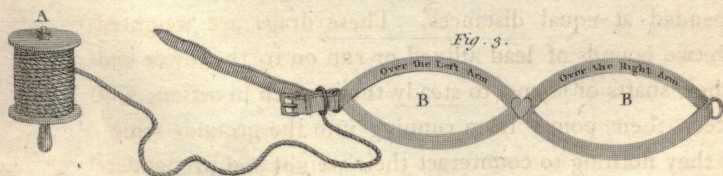
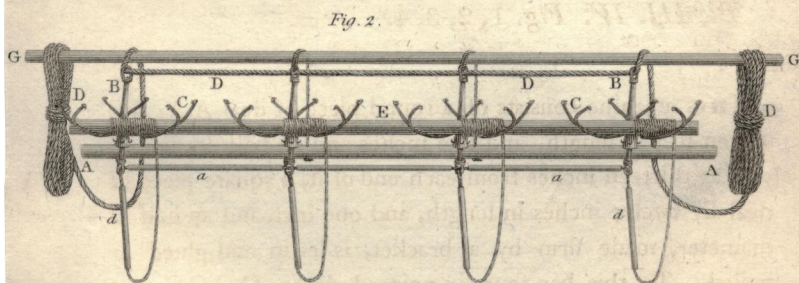
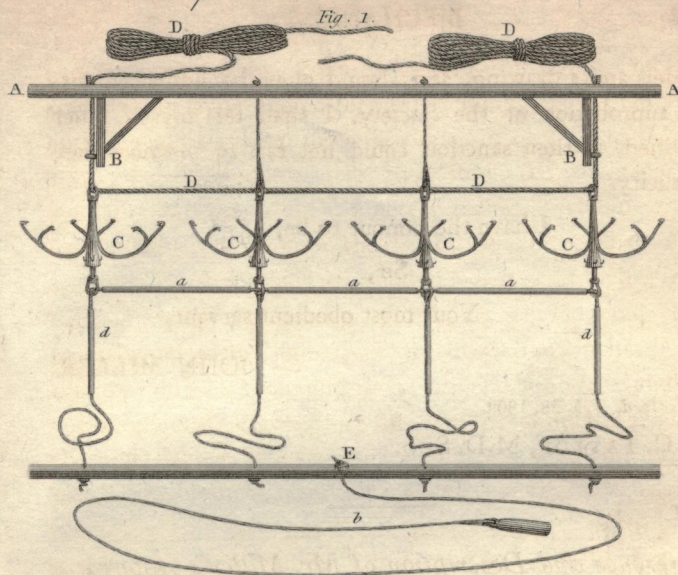
TO C. TAYLOR, M.D. SEC.

*Reference and Description of Mr. Miller's Apparatus
for Raising the Bodies of Persons sunk under Water.
Pl. III. IV. Fig. 1, 2, 3, 4.*

THIS machine consists of a round piece of deal A A, fig. 1, ten feet in length, and two inches and an half in diameter; at thirteen inches from each end of it, a square piece of deal B, twelve inches in length, and one inch and an half in diameter, made firm by a bracket, is let in and glued or nailed. To this bar four six-pointed drags, C C C C, are suspended at equal distances. These drags are weighted with two pounds of lead affixed or run on to the lower end of their shafts or stems, to steady them when in action, and to keep their points from running into the ground, which had they nothing to counteract their weight and preponderancy at top, they would do. The buoyancy of the bar on the one hand, and the weight of the lead at the bottom of the drags on the other, has the effect of keeping the drags
in

*M^r. Miller's apparatus, for raising the Bodies
of Persons, sunk under Water.*

Pl. 3.



in an upright position when at rest in the water, and in a diagonal one when pulled forward, scraping the ground, but not entering it. Each drag, as shewn in Pl. IV. fig. 7, has a swivel at both ends of its shaft or stem. Its whole length, including swivels, is about nineteen inches. At nine and a half inches from the top, the hooks, which are three only at their base, but which are subdivided at eight inches from their ends, take their rise. They are curved, and their points when turned up again are about four inches below the level of their tops, and thirteen inches asunder; and the outside point of each sub-division is thirteen inches from its adjoining one. The extreme points are split and formed into a double hook, very sharp and pointing towards the stem.

Holes are bored through the bar A at equal distances, so as the hooks when suspended may approach each other within five inches. Through those at the end, which are larger than the others, and made close to the pieces of wood let into the bar, the principal or drawing ropes DD pass. This rope is of considerable length and strength, and goes through the top-swivels of all the drags. It is then made fast by wooden wedges driven into the holes through which it passes, at such a length as will suspend the two end drags a few inches below the end of the pieces of wood let into the bar. The other three drags are suspended at the same distance from the bar by lines of an equal length coming through the holes in the bar, and tied to their top-swivels. These three drags, as well as the two end ones, are made fast to the principal or drawing rope at equal distances with a piece of tar-line tied to their top-swivels. And the two outside drags are kept in their proper situation by the principal rope going through a staple fixed in the pieces of wood let into the bar, and the two others are kept either
from

from approaching or entangling with one another, or the outside ones, by bored pieces of wood, *a a*, of equal lengths placed between each drag at the bottom, through which and their bottom swivels a rope made fast to the bottom swivels of the two outside drags passes. The drags, however tied or fastened their swivels may be, always have their own rotary motion free, consequently their points by their own gravity will always assume and retain their proper position when in action. The bar clears the way for the drags, breaking and removing weeds or what else might otherwise impede their progress and action. The drags, being suspended to the bar and separated from each other by nothing but what will give way, are undulatory in their progress as the bottom is, but will yet preserve the full extent of their sweep.

Thus formed, the machine is ready for use, and may be drawn in this shape backwards and forwards at pleasure; but should the water wherein it is to be used be thought to contain roots of trees, or any thing likely to occasion the necessity of drawing up or releasing any one of the drags from the obstacle it has met with, then another appendage is advisable: a bar *E*, less in substance than the leading one, but of the same length, and which, for distinction sake, I call the floating-bar. Holes are made through this bar at the same distance from each other as those in the leading bar, and ropes of equal length (either ten feet, or any other length that may be chosen) after having been tied to the bottom swivels of all the drags are to be brought through these holes, and there stopped, either by a knot or pieces of cork at their ends. By this means any particular drag may be got at, without altering the position of the others, for, as far as the flexibility of the rope in the intermediate spaces between the several drags will admit, each is free and independent of the other;
and

and since, by means of these ropes, a parallelism is preserved from the leading-bar to the floating-one, the floating one of course brings into view the direction the one which is sunk is taking.

Should the current of water be strong, it would carry the floating-bar before the leading one in drawing down stream. A rope *b*, therefore, weighted with a stone or piece of lead at its end, is requisite. This will act as a kind of anchor to it, will steady it, and keep it where it ought to be, behind the leading one. If bored pieces of deal *dd*, 15 inches long, are, after passing the ropes of the floating-bar through them, made fast by wooden wedges to those ropes, at three inches distance from the bottoms of the drags, they will by their buoyancy and tension prevent these ropes of the floating-bar entangling round the points of the drags.

With the floating-bar attached to it, the progress of the bar cannot be instantly changed from straight forward to retrograde. For without making a sweep something circuitous, the ropes would entangle. But if a rope is fastened either to the middle of the floating-bar, or to that rope which operates as an anchor to it, by means of that the whole machine may be drawn back, and the same sweep repeated as often as required.

Should the floating-bar, for the purpose of disengaging any particular drag be thought unnecessary, but that it is desirable to know what direction the one sunk is taking, and that the drawing backwards and forwards is an object, the floating-bar, provided the holes at the ends of it are made sufficiently large, will do this by changing its direction from being a following bar into that of a leading one by this means. Detach it from the drags by untying its ropes from the bottom swivels. Pull them out of the floating-bar, and then pass the two ends of the principal or drawing rope
through

through the holes next the ends of it, and let it slip down to the leading bar; its own buoyancy will bring it to the surface of the water, and the operation of a man's pulling the drawing rope, will, by compression, keep it there.

The cost of this drag and appendages is three guineas.

Plate III. fig. 2, represents the drag in the state in which it should be preserved ready for use, or the manner in which it should be carried from place to place, to prevent any part from entangling. G G is a pole over which that part of the apparatus marked A and B is laid, and on which the cords D D folded up are hung, the drags C C C C remain suspended on the nearer side of the pole, and the floating-bar E is laid within the drags with the hollow tubes *d d* below it.

Plate IV. fig. 7, shews one of the drags separate from the rest of the apparatus, with the dimensions of each part of the drag on an enlarged scale.

So closely connected with this subject of life preservation are two other machines which I have had made, that, on the presumption that a description of them will not be unacceptable, I shall annex it.

One of them I call the Reel Safeguard, devised by me for the security of persons going to the assistance of a drowning person, or diving for them.

The other a Missile Rope, capable of being flung to a person in distress, at a considerable distance from the shore.

This missile rope, (fig. 4, plate III.) 35 yards in length, is rendered buoyant by pieces of cork fastened to it, at intervals of three or four feet. It is made fast at one end to a wooden reel A, six inches in diameter, and sixteen in length, on which it should always be kept wound, to prevent the ropes kinking, and for being in readiness. But when used, it must be unwound, because the corks are an obstacle to its running off the reel in the throw, and it should

should be spread on the ground, or held in the hand, free from entanglement, so as not to catch or impede the throw. The throwing end of the rope is fastened to a piece of wood B shaped like the but end of an oar, as no shape can be better devised for the purpose of throwing it from the hand. The person throwing it holds fast the reel in his other hand.

The cost of this is seven shillings and six-pence.

The reef safeguard consists of a rope or line thirty-five yards long, made fast at one end to a reel (A, fig. 3) six inches in diameter, and ten in length. To the other end of this rope, a brass or iron tinned ring, large enough to admit of the leather and buckle part of the shoulder-straps passing through it is fastened. The other part consists of two straps B B, of strong sadler's web, 2 inches wide, crossing each other, and well sown together just above the pit of the stomach, and after leaving a sufficient space for admitting the arms, the ends on each side are fastened together. To the ends behind the left shoulder, a brass or iron tinned ring of an inch and half diameter is well fastened, and to the ends behind the right shoulder, a buckle and strap 18 inches long is fastened. If the space for the arms to pass through is proper, and the ring behind the left shoulder, and strap behind the right, properly placed, the pull from behind will be so equal, that the brace will neither press on the pit or stomach, or the windpipe; two essentials in swimming and diving. To insure this safeguard being put on properly, when hurry requires the use of it, "*Over the left arm,*" "*Over the right arm,*" should be written or stamped on the inside of the web part with printer's ink. The person using this, slips his arms into the brace, whilst another, having first passed the buckle and strap (which is at the end of the brace behind the right shoulder) through the ring at the end of the rope, puts the strap through the

ring behind the left shoulder, and buckles it to the size of the wearer. This person keeps fast hold of the reel, whilst the wearer plunges into the water; and the facility with which the rope runs off the reel, prevents its being any impediment either in swimming or diving.

When it is required to pull the person wearing it to the shore, it is not to be done by winding the rope on the reel, but by shortening the rope by passing one hand over the other as quick as possible. This will pull the wearer on his back, and from the elevated position of the person pulling, whether he is on shore or in a boat, the wearer's head and shoulders will be pulled out of the water, and prevents the immersion of his head either from debility, his efforts, or any weight he may have hold of.

The cost of this is eight shilling and six-pence;

Certificates were received from JOHN WING, Esq. Mayor of Bedford; Dr. G. YEETS; Mr. CHARLES SHORT, Surgeon; and Mr. P. NASH; stating that they had witnessed the experiments made by Mr. Miller's Drags, and are of opinion, that they are well calculated for quickly finding and raising the bodies of persons who have sunk under water, and that the escape of a body when once touched therewith seems almost impossible.

The SILVER MEDAL of the Society was this Session voted to Mr. THOMAS NEWTON, of Bridge-street, Blackfriars, for a Machine for Cutting Roots for Cattle, Articles for Dyers' Use, or for Culinary Purposes. The following Communication was received from him, an explanatory Engraving is annexed, and a complete Model of the Machine is preserved in the Society's Repository.

SIR,

I HAVE taken the liberty of submitting to the inspection of the Society of Arts, &c. the model of a machine for cutting roots and different substances, and which is particularly well calculated for the chopping of sausage meat. Though its value in this latter respect may at first appear inconsiderable, yet the great demand in most towns for that article, and the many hands it requires to make the meat fit for use, will, on inquiry, show that it is of consequence. Many of the sausage makers employ four or five men constantly in this business, and frequently three or four hundred weight of meat is cut up by one house in a day.

The advantages of this invention consist in saving labour, time, and waste of meat. There are in this machine five knives, which are let into an iron plate, which is screwed to the working bar.

The knives are fastened by bolts passed through them close under and above the plate.

The sliding plate is for the purpose of preventing the meat being scattered; and to this plate are added scrapers,

K 2

which

which are screwed underneath, for the purpose of clearing the knives at every stroke.

The spring raises the knives, and enables any person to chop at least twenty times as much meat in the same time as can be done by the common mode.

The length of the knives being equal to the breadth of the trough, no meat can possibly escape the knives, nor will the meat require so much turning as is usually wanted. If it should require turning, it is easily done by alternately pressing the knives at either end of the trough, sliding them towards the middle.

When the meat is sufficiently chopped, the bar to which the knives are fixed may be lifted entirely free from the sliding plate, by taking the pin out of the guide. Indeed the whole of the moving apparatus may be turned in any direction as occasion may require.

The same machine is also applicable for cutting fat, suet, &c. previous to rendering them into tallow; likewise to chopping madder and other roots for calico-printers, or as used in their recent state for dyers; also for dividing potatoes, carrots, and other esculent roots for farmers in feeding cattle, and may be made at a moderate expense, worked with ease by the hand, and when occasion requires, easily repaired.

Any further information which the Society requires will be furnished with the greatest respect by,

Sir,

Your most obedient humble servant,

THOMAS NEWTON.

No. 6, Bridge-street, Blackfriars,

Feb. 20, 1809.

To C. TAYLOR, M. D. SEC.

A Certificate

A Certificate was received from Mr. CHRISTOPHER CHRISTIAN, of Liverpool, stating, that Mr. Thomas Newton did there invent a machine for chopping meat, &c. which answered the purpose it was intended for in every respect; and that for ease and quickness of cutting he, Mr. Christian, particularly recommended it.

*Explanation of Mr. Newton's Machine for Chopping
Meat, Roots, &c.*

MR. NEWTON's machine for chopping meat and various other articles is shown in Pl. IV. Fig. 1. The meat is put into a wooden trough AA, which is a segment of a circle: its form is more clearly shown detached at fig. 2, on the ground. This trough is fixed upon a triangular frame, supported by four legs, about the height of a common work bench. *a* is a short iron axis which is fitted to the angle of the frame, and is the center from which the circle of the trough is struck; it is made forked at the top, to form a joint for the end of the lever B (shown separately on the ground at fig. 3), having the five knives *b* for chopping the meat fixed to it. At D are two pieces of wood, through one end of which the center pin of the lever B passes, and thus connects them with the axis *a* at the other end; they carry a piece of iron plate F, which has five narrow openings made through it to receive the five knives fixed on the lever B. This iron plate always rests upon the edges of the trough A, and acts so as to scrape off the meat, &c. which

would otherwise adhere to the knives. The knives are prevented from rising, so as to be quite lifted out of the openings in the plate F, by the wire pin C, put through the small pieces of wood fixed to the pieces of wood D. A spring *l* is fixed to the axis *a*, and presses on the under side of the lever B to raise it up, that the chopping may be performed the more speedily, as the hand has only to force down, the knives being raised by the spring. The knives are worked by the lever continually backwards and forwards in the trough, so that the article therein is in every part exposed to their action.

When the knives require grinding, any one can be taken out by removing two iron pins: each knife has two tenants (as shown at X, fig. 4) on the back of it, going through corresponding mortises made through a piece of wood fixed under the lever B. The two pins pass through those tenants, and thus hold the knives in their places. The bottom of the trough A is held in by screws, so that it can be taken out and planed flat when worn by the action of the knives.

The perforated plate F is shown separately in figs. 5 and 6.

The

The GOLD MEDAL of the Society was this Session voted to Captain WILLIAM BOLTON, of the Royal Navy, for his Naval Improvements.

Some doubts having arisen as to the practicability of Rigging Captain William Bolton's Improved Jury Masts, described in Vol. XXVI. page 167, of the Society's Transactions, he in consequence has sent to the Society another Model thereof completely rigged, which obviates all difficulty therein; and likewise has added another Invention of his contrivance, for the better Securing the Shrouds of Rigging; explanatory Engravings of both are annexed, and the Model is preserved in the Society's Repository.

SIR,

FINDING some doubts were entertained relative to the practicability of rigging jury masts, upon the plan I had the honour to present to the Society in Oct. 1807, I beg you will lay before them a model completely rigged, from which it will appear that the rigging so placed will give, from the angle being more obtuse, greater security, and supersede the necessity of catbur pinning, and admit of the lower yards bracing sharper up.

K 4

The

The hint which I gave formerly relating to striking a top-mast is now carried into effect, by the mode in which I have fitted the top-mast rigging, which admits of it being set up, almost instantaneously, at any point the mast shall descend to; the advantages of which are many, more particularly when the ships are riding hard in open roadsteads; for, by striking the top-mast, ships will be enabled to ride much longer at their anchors, and still be ready to make sail on their top-masts, according to the state of the weather, which will or ought to determine the distance to which the masts are struck. In this model I also present to the Society a plan, the earliest of my mechanical pursuits, for setting up a ship's lower rigging, which will be effected by one man; whereas in the ordinary way it is performed by an assemblage of tackles, and the labour of a whole ship's company: the larboard side of the model is fitted up according to the old plan; the starboard side with my improvement, which consists simply of a screw attached to each shroud, and tightened by a nut under the channels, which should be well secured by iron clamps or knees for that purpose: the expense will be far less than in the common mode; and I do think the bare inspection of the model will be sufficient to establish its superior efficacy.

I will thank you to expunge the passage from page 168 in the last volume, after the full stop at *main-top*, and substitute the following:

“The spare fore top-mast passes through a cap made from strong plank, *b*, into the square holes of which the heads of the two temporary masts above-mentioned are inserted, and the heel of the top-mast is fidded on the tressle trees or top as in common, and the mast rigged as usually. The object of the strengthening cap *G*, is to steady the spars,

spars, and also serves to fid the top-mast on, if thought necessary."

I have the honour to be,

Your obedient humble servant,

WM. BOLTON.

H. M. S. Fisguard,
Portsmouth, May 12, 1809.

To C. TAYLOR, M.D. SEC.

*Reference to the Drawing of Captain Bolton's Rigged
Jury Mast, and his Improved Mode of Securing
the Shrouds, Pl. V. Fig. 1, 2, 3, and 4.*

A A represent the partners or pieces of timber which are bolted to the quarter-deck for the mast to rest upon. B is the stump of the lower mast, which is cut square at the top, and of the same size as the head of the mast originally was; upon this square the main and spare lower caps *a a* are fixed; two mortices must be cut in the partners A A, to receive squares made at the lower ends of the two temporary masts D D, which are supported by the caps *a a*, one of them is a spare main top-mast, the other a hand-mast; these two support the main-top E, additional squares being made on the tressel trees to receive each of them. *b* is a cap shown in fig. 3, made of four-inch plank doubled for the purpose, and fitted upon the heads of the masts D D, for a fore top-mast F F, the heel of which rests in a mortice made in the stump of the lower mast; it is also steadied by a double cap G, separately shown in fig. 4, on which it fids finally on the

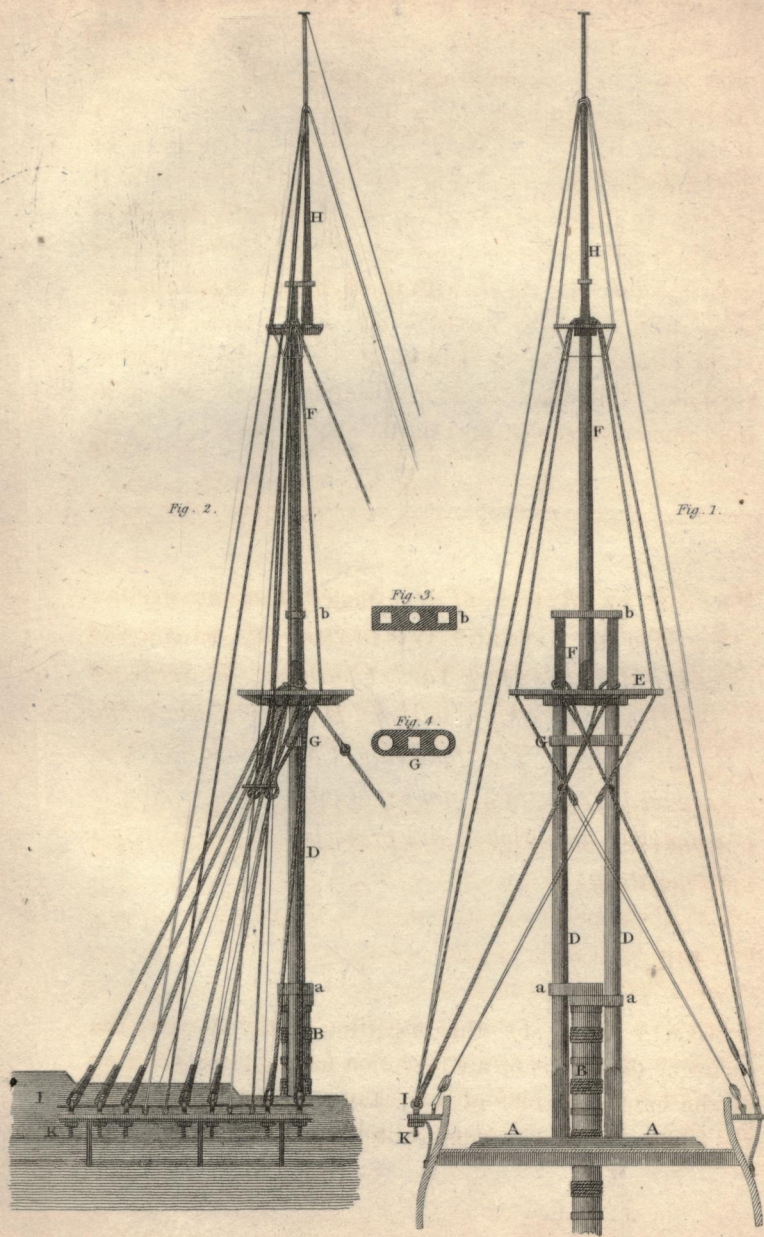
the top. The top-gallant mast H is fixed to the mast F by the top and cap in the usual manner. The figures 3 and 4 show the caps separated from the masts, and are the only things necessary to be made for the purpose ; and the object of the cap, fig. 3, is to steady and prevent any wringing of the lower jury-mast, and to fid the top-mast whenever it is reefed. In the proposed method of securing the shrouds of ships in general on the starboard side, I, represents the screws with loop holes for the shrouds to be lashed to, and K the screw nuts, which by means of a proper wrench may be easily turned, so as to tighten or slacken the shrouds at pleasure. The other side of the ship is shown fitted up in the common way, that the contrast may be observed.

The SILVER MEDAL of the Society was this Session voted to Mr. GEORGE WILLIAMS, Master Carver at his Majesty's Dock Yard, Chatham, for Securing the Beams of Ships, without Wooden Knees made of one Piece. The following Communication was received from him, an explanatory Engraving is annexed, and Models are preserved in the Society's Repository.

SIR,

I SUBMIT to you, for the inspection of the Society, the following particulars of my invention for the better securing of the beams of ships of war, East and West India ships, and all others where strength, dispatch, room, and cheap-
ness

Pl. 5.
*Capt. Bolton's method of rigging his Jury Mast,
 and setting up a Ship's Lower Rigging.*



Drawn by J. Fargy, Junr.

Engraved by J. Porter.

ness are required. In this method less iron in weight, and fewer bolts are necessary than in the iron knees before in use; there is also less strain upon the bolts, as the block underneath is morticed both into the beam and side of the ship, as well as bolted.

Upon this plan the work is all done under the hand, which is executed much quicker than in the former plan, where the work is all done over hand, and where great nicety is requisite in making the bolt-holes which pass through both the iron stays. In my method much more room is also gained between decks for stowage and working the guns, and even a port-hole may be made under the beam itself.

I calculate the saving in a 74-gun ship or East India-man to be as follows, viz.

	<i>Ton.</i>	<i>Cwt.</i>	<i>Qrs.</i>	<i>lb.</i>		<i>£.</i>	<i>s.</i>	<i>d.</i>
Copper bolts, 2	1	3	9	at 1s. 4d. per lb.		305	8	0
Iron,	2	12		at 56s. per cwt.		145	12	0
Three men and one boy's time for a month						45	17	6
Timber	.	.	.	.	.	50	0	0
						£. 546	17	6

The models I have sent will, I trust, clearly explain to the Committee every circumstance which will be thought necessary.

I am, Sir,

Your respectful humble servant,

GEORGE WILLIAMS.

His Majesty's Dock-yard, Chatham,
May 10, 1809.

TO C. TAYLOR, M.D. SEC.

Description

*Description of Mr. Williams's Method of connecting
the Beams of Ships' Decks to their Sides, Plate VI.
Fig. 1, 2, and 3.*

By inspecting Plate III. of Vol. XXVI. of the Society's Transactions, in which is another method of accomplishing the same object, invented by Mr. Roberts, the reader will readily comprehend the situation of this contrivance in the vessel, being a substitute for the wooden knees commonly used to connect the cross beams of the ship with the sides. Fig. 1 is an horizontal plan of a portion of a ship's side, the planks of the deck being removed to shew the ends of two of the beams A A, which extend across the vessel. B B is the outside planking of the ship; C C the sections of the timbers or ribs; and to these the beams A A are fastened by beaten iron triangular braces *a a*, similar in form to the Roman capital letter A. These are let into the beams, and attached there at the angle by three bolts going through them. Fig. 2, is a front view of only one beam, where the spectator is supposed to be looking towards the ship's side; and fig. 3, is part of a cross section of the vessel's side: the same letters are used as in the other figures. By inspecting these, it will be seen that the ends of the brace *a a* are turned up and bolted to the timbers of the ship's side by two bolts passing through each end and through the timbers and the outside planks, by this means the beams are secured from lateral motion; and to brace them in a vertical direction the wooden block H, fig. 3, is fitted in beneath them, and two iron straps bolted on them; one end of each of these straps is attached to the deck beams by the same bolts as the upper brace *aa*: the other ends are bolted against the inside planking, and an oblique bolt *h*, fig. 3, passes through the middle of each strap

strap and the ship's side: *lll*, fig. 1, are the small intermediate beams, answering to the joists of a floor, to which the planks of the deck are spiked down: *m*, fig. 1, represents one of the planks, and the dotted lines show the joints of the others. In fig. 3, these planks are shown, and the other beams to make all sound and firm, which were removed in the other figures to show the braces.

The SILVER MEDAL of the Society was this Session voted to Mr. J. VARTY, of Liverpool, Coachmaker, for his Invention of a Method to prevent the Accidents which frequently happen from the Linch Pins of Carriages breaking or coming out. The following Communication was received from him, and a Model of an Axle and Linch Pin are placed in the Society's Repository.

SIR,

HEREWITH you will receive a model of an axle-tree for public machines, intended to prevent the wheel from coming off if the linch-pin should break, and thereby prevent many dangerous consequences. When the idea first suggested itself to me, I put it in practice in a stage-coach which has since run from Liverpool to Lichfield, a distance of eighty-four miles, six days per week, for the last six months. During that time several instances have occurred in which the linch-pins have broke or come out, but owing to this contrivance no accident has happened therefrom. We
almost

almost daily hear of stage-coaches being upset, which more frequently arises from linch-pins breaking than from any other cause.

In offering this model to the Society of Arts, &c. for their inspection, I anticipate the pleasure of their sanction, as I can furnish satisfactory vouchers of its proved utility.

I am, Sir,

Your's, respectfully,

J. VARTY.

Liverpool, Feb. 6, 1809.

TO C. TAYLOR, M.D. SEC.

CERTIFICATES were received from Liverpool from the following persons, who declare that they have witnessed many very melancholy accidents happening to passengers in stage-coaches, in consequence of the linch-pin breaking made in the common way, and from which some of them have been sufferers; but that they have never seen or heard of any such accidents where Mr. Varty's invention was made use of, though several of his linch-pins have broke.

HENRY LIVESLEY, who had a broken leg in consequence of one of the common linch-pins breaking.

JOHN SMITH, who suffered a similar accident from a similar cause.

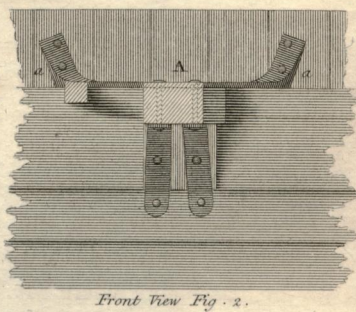
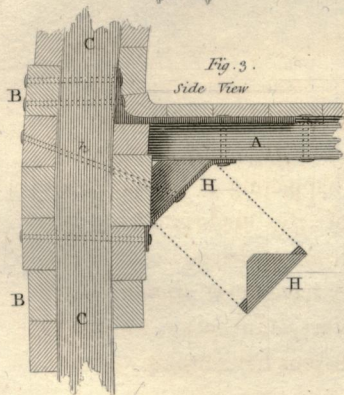
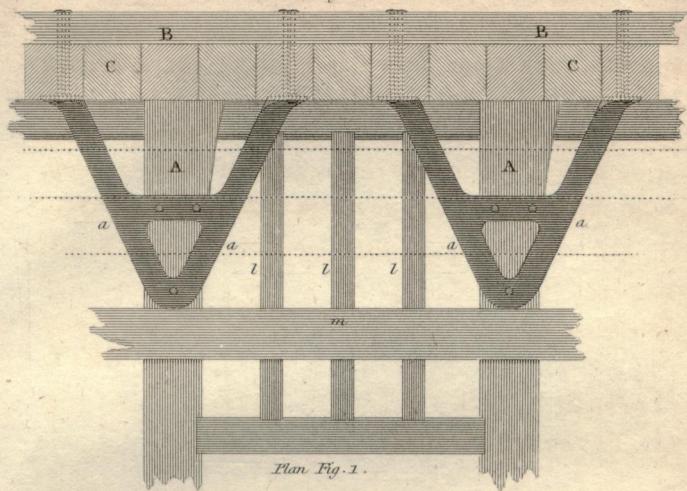
JAMES KELLY, Guard to the royal Liverpool coach.

JOHN ARMSTRONG, Coachman.

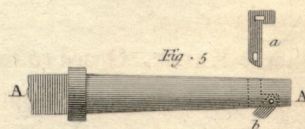
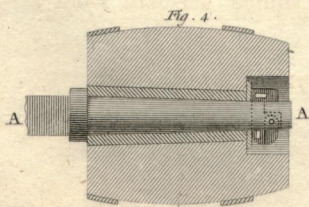
JAMES WHITE, Guard.

GEORGE

Mr. Williams method of connecting the beams of Ships with their Sides.



Mr. Vartys improvement in the Linch Pins of Axletrees.



GEORGE ROBINSON, Manchester coachman.

JOHN CASTREE, ditto.

WILLIAM CAWKWELL, ditto.

GEORGE KAYE, ditto.

RICHARD MOUNTAIN, Coachman.

Description of Mr. Varty's Linch-Pin.

MR. VARTY'S contrivance is shown in fig. 4 and 5, Plate VI. Fig. 4 is a section of the nave of a carriage wheel, with the axle-tree A A in it; and fig. 5 is a separate view of the axle-tree. *a*, fig. 5, is the linch-pin detached; it is put through an oblong hole in the axle as usual, but there is likewise an additional linch-pin *b*, to make it complete, which is fixed in a recess cut for it in the axle, and turns on a pin (as is shown in the figure) into the hole left, by removing the linch-pin *a*, when the wheel is to be taken off; but if the linch-pin *a* should accidentally get out, this additional pin *b* would effectually keep the wheel on, as its hanging position does not at all tend to shut the pin up into the axle, but the contrary. The common linch-pin *a* is put in downwards, that its weight may also tend to keep it in, and is secured in the usual way by a strap, the holes for which may be seen in the figures. The whole when in its place is shown by fig. 4.

The

The GOLD MEDAL of the Society was this Session voted to MATTHEW MURRAY, Esq. of Leeds, for a Machine for Hackling Hemp or Flax. The following Communication was received from him, an explanatory Engraving is annexed, and a complete Working Model is preserved in the Society's Repository.

SIR,

HAVING invented and put in practice a machine for the purpose of hackling flax and hemp in an expeditious and more perfect manner than hath hitherto been done either by hand or machinery, I have taken the liberty of sending a model thereof to the Society. From its national importance as a powerful auxiliary to the state of our linen manufactory, which is at present cramped by the refractory conduct and inability of hand hacklers, it has been represented to me that this machine, which will produce the best effect on the material, is extremely desirable. I believe that I have completely effected the end, and hope that this machine will deserve the Society's attention.

I have the honour to be,

Sir,

Your most obedient humble servant,

MATTHEW MURRAY.

Leeds, Feb. 10, 1809.

TO C. TAYLOR, M. D. SEC.

SIR,

SIR,

IN answer to your further inquiries, it is with pleasure I can inform you that the hackling machine succeeds equal to my expectation. The principle of it is, that the flax is brought perpendicularly down upon the teeth of the hackles. The hackle moves through the flax in the direction of the fibres, and is only suffered to penetrate as the fibres become open or separate. By this circumstance a great saving in the waste of flax is made, and the flax thus dressed attains a higher degree of perfection for spinning.

The quantity of the dressed flax obtained from a given weight by this machine, in comparison with that dressed in the ordinary way, is obvious, when the properties of the machine are examined. It reduces the operation to a certainty, which was not so before, which is of material importance for mill spinning, as flax does not undergo any other separating process after being hackled, but is taken immediately from the hackle to the rollers. No carding, as is done to cotton or wool, can be applied to flax, therefore the necessity of perfect hackling may be easily inferred; and the performance of this machine gives me great hopes that we may now be enabled to manufacture our finest linen fabrics by machinery at a cheaper rate than at present, as a similar reduction has taken place in cotton manufactures since the invention of spinning cotton by machinery. I have inclosed certificates from three gentlemen who have attended the performance of the machine this month past, and who have determined to introduce them into their extensive manufactories for spinning linen yarn.

Messrs. Bell and Bragg, proprietors of a large flax mill at Whitehaven, have also given orders for machinery to be

L

begun

begun upon this principle ; and from the performance of the machine I have no doubt of its success.

I am, Sir,

Your most obedient humble servant,

M. MURRAY.

Leeds, April 10, 1809.

To C. TAYLOR, M. D. SEC.

CERTIFICATES.

WE, whose names are hereunto subscribed, have examined Mr. Murray's machine for hackling flax and hemp, and we are of opinion that it will be a great advantage to the flax spinning mills and linen manufactories, as it appears to have the properties of dressing the flax with more certainty and suitableness for mill-spinning.

It does not make so much waste as is generally made by hand. The savings in the trials we have seen are about one-tenth compared with the same flax hackled in the old way. The machine now dresses three hundred weight of flax per day, and requires not more than two-thirds of the cost in attendance as hackling by the hand.

The simplicity of the machine renders it perfectly easy to manage with little care.

DAVID WOOD,
JAMES TENNANT,
JAMES SHAW,
GEORGE COBB.

Leeds April 10, 1809.

Description

*Description of Mr. Murray's Machine for Hackling
Hemp. Plate VII.*

A perspective view of Mr. Murray's machine for hackling hemp will be found in Plate VII. The flax is combed or hackled by three hackles, A B C, (one of which is shown detached in fig. 2), fixed in the circumference of a large cylinder or drum, which is turned round in the direction from A to B, by the action of a water wheel, steam engine, or any other first moving power; the flax or hemp is attached to the square frame E, which moves upon the points of the screws *a b*, as an axis; one end of the parcel of hemp to be hackled is placed between the two pieces of wood *e, f*, called hands, shown separately in fig. 3, which are placed on the frame, and held thereto by two screws *g, g*, which also draw the two pieces of wood *e, f*, close together, and thus confine the flax or hemp to the frame E, as the cylinder turns round the ends of the hackle or combs A B C, which project beyond the plane of the cylinder, meet the inclined plane *h*, (shown by dots) upon the frame E, and is raised upon the centers *a, b*, so that the teeth of the hackle can pass by clear of the frame E; the inclined plane now drops off the ends of the hackles, the hemp falling upon their teeth, which proceed forwards, and comb it in a manner similar to the action of the hand.

The end of the axis upon which the cylinder is mounted has a pinion of eleven teeth fixed upon it, which turns a wheel *i* of forty-four teeth, having a pinion of fourteen teeth fixed to it, and thereby turning a large wheel, *k*, of seventy teeth; the axis of this wheel goes through the whole length of the frame, and has at the other end a spiral plate or snail *g*, fixed upon it, which makes one revolution to every

twenty of the drum; l is the center of a lever m , one end of which is supported on the snail, while the other forms a stop to the frame E , and prevents it falling upon the cylinder; as the snail turns slowly round, this lever is alternately elevated and depressed, and by that means the frame E falls gradually nearer to the cylinder, and the teeth of the hackles enter farther into the parcel of hemp suspended from the frame E . The operation of the hackling is begun at the time when the claws of the lever m , has just fallen from the largest to the smallest radius of the snail y , consequently the end which supports the frame E , is at its greatest height. The two screws $g g$, must then be turned back, the two pieces of wood or hands $e f$, taken away and opened, as shown in fig. 3, and the end of a parcel of hemp is placed between them; they are now returned to the machine, the hemp being turned down between the piece of wood y , and the cross-bar of the frame E , by tightening the screws $g g$, the hemp will be held tight, so as not to be drawn out by the action of the hackles. The machine is now put in motion, and as the hackles pass by they lift up the frame E , then let the hemp fall upon the teeth of the hackles; at the commencement of the operation it falls but a small distance on the point of the hackles before it is stopped by the end of the lever m , by this means the ends of the hemp only are hackled at first, but as the operation proceeds, the snail turns round and permits the frame E to fall further, that the teeth of the hackles may take deeper hold of the hemp, till at length when the great cylinder has made twenty revolutions, and the hemp has been hackled sixty times, the snail has raised the lever to the highest, and the teeth of the hackle pass quite through the hemp; and as soon as the lever drops to the smallest radius of the snail, the first operation is supposed to be completed, the machine is thrown out

Fig. 1.

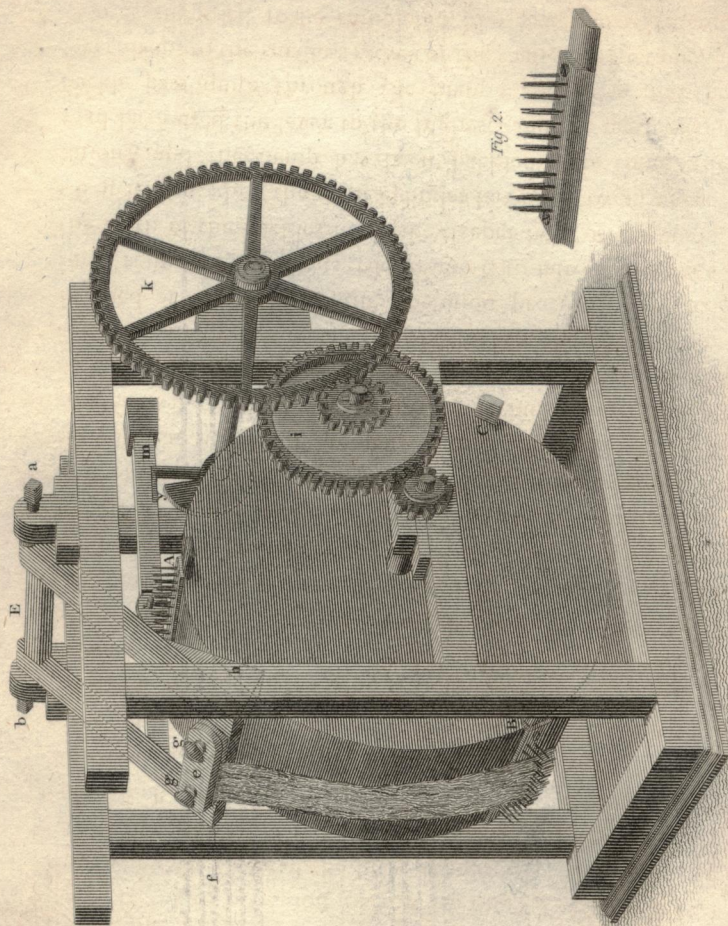
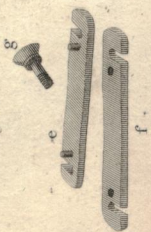


Fig. 2.



Fig. 3.



*M^r Murray's.
Machine for Hockling
Hemp.*

Engraved by S. Prior.

Drawn by J. Perry, Junr.

out of gear and stopped, and the hemp is unwrapped and reversed, that the other end may be also hackled; and when that is hackled, it is then removed to make room for a fresh parcel. Fig 2, is a separate view of one of the hackles detached from the cylinder, showing the manner in which it is dove-tailed into the cylinder and held by two screws.

The SILVER MEDAL of the Society was this Session voted to Mr. KNIGHT SPENCER, of Bromley-Lodge, near Bow, for an Anthrope Telegraph; or Mode of Communication in the Day or Night, by Disks. The following Communication was received from him, an explanatory Engraving is annexed, and the Disks and Lanthorn, with a Drawing, are reserved in the Society's Repository.

SIR,

I REQUEST your permission to lay the enclosed before the Society of Arts, &c. It is a drawing of a Portable Military Telegraph, which I invented so long ago as the year 1804, and I am proud to say, that Admiral Hunter, who was stationed at Portsmouth in 1806, gave it as his opinion, that it was very applicable to naval purposes. I have lately been making satisfactory experiments with it by *night*, and should you deem it worthy encouragement, I would solicit permission personally to explain the whole of my operation to the Committee.

I am, Sir,

Your obedient servant,

KNIGHT SPENCER.

Bromley-Lodge, near Bow, Oct. 26. 1808.

TO C. TAYLOR, M. D. SEC.

L 3

DEAR SIR

DEAR SIR,

AGREEABLE to the wishes of the Committee of last night, I now enclose you two letters from Admiral (then Captain) Hunter, dated the 18th and 27th of April, 1806, on the subject of my telegraph, and I find by referring to my painter's bill, that my *first disks* were made in July or August 1805, and I made experiments with them at Brighton at that time, in company with Mr. Talver, hop merchant, in the Borough; Mr. Pritchard, oil-merchant, West Smithfield; and several other gentlemen, whose names I have forgot; but the idea first occurred to my mind in 1804.

I trust that these particulars and documents will prove my invention as far back as the summer of 1805.

I have also, agreeable to the wishes of the Committee, sent you a pair of disks made early in 1806.

I am now preparing a proper set of lamps (or lanthorns) for night signals, which I will lay before the Committee, if required, and at the same time give such further explanation as they may deem necessary.

I am, dear Sir,

Your obedient servant,

KNIGHT SPENCER.

Bromley-Lodge, Dec. 9, 1808.

TO C. TAYLOR, M. D. SEC.

Letters

*Letters from Admiral Hunter respecting Mr. Knight
Spencer's Anthro-Telegraph.*

(No. I.)

MY DEAR SIR,

I had the pleasure of receiving your favour of the 14th, and have not since been so fortunate as to see Captain Irwin, otherwise you should have heard from me sooner. I have, however, been to the Admiral's office, where all telegraphic concerns are transacted; and in the possession of Lieutenant Harrison (a clever intelligent officer) I found your portable machine. Mr. Harrison told me, that he thought it a very good thing, and would be very useful between ship and ship at sea, when the weather was too bad to have any communication by other means; indeed it appears to me to be superior to any other mode of communication by signal; it is so perfectly simple that a child may understand it. Mr. H. has the management of all the telegraphic signals here, and is completely master of that kind of conveyance. He said that Captain Irwin with him had tried it from the battery at Portsmouth, to the flag-ship at Spithead, and they understood every signal, and answered them. He is going soon to try it on South-sea Common, when I will endeavour to be there.

I am, dear Sir,

Very truly your's,

JOHN HUNTER.

Portra, April 18, 1836

TO KNIGHT SPENCER, ESQ.

Bromley Lodge, near Bow.

Letter from Admiral Hunter.

(No. II.)

DEAR SIR,

As I suppose you may be a little impatient to know if we have made any further observations upon your portable telegraph, I would not delay informing you, that I received the pair of disks or circulars addressed to me, and that Captain Irwin, Lieut. Harrison, and myself, went out yesterday to South-sea Common, and gave them a fair trial, and I have pleasure in saying, that we were much pleased with the very simple manner in which we could converse at a considerable distance with them. We applied them to Sir Home Popham's telegraphic vocabulary, which answered our most sanguine wishes. The men here who reside at the telegraph-house, and are employed in working it, were so pleased with its simplicity, that they were of opinion they could make themselves understood in a clear day on Port-down-hill, if the circulars were enlarged to two feet diameter, a size which from their being so light and manageable, I would recommend; and let the ball be one foot, and the rim six inches. We approve the black and white colours best, painted as those you sent me; on one side black ball and white rim, on the other a white ball and black rim; and according to the state of the weather, that side can be used which is best seen.

I am, dear Sir,

Very truly your's,

JOHN HUNTER.

Portsmouth, April 27, 1806.

TO KNIGHT SPENCER, ESQ.

Bromley-Lodge, near Bow.

Letter

*Letter from Henry Lawson, Esq. respecting Mr.
Knight Spencer's Anthrope Telegraph.*

DEAR SIR,

IN answer to your enquiry, about the time I had the pleasure of making some experiments with you, to ascertain the utility and performance of a manual telegraph, contrived by you for the purpose of communicating with promptitude, and without risk of mistake, to any distance, without any other apparatus at each station, than two wooden or wicker disks, to be held by the hands; and if the persons using the disks were obliged to station themselves further from each other than the unassisted eye could command, in that case a pocket telescope was to be used.

If I recollect right, you told me you had made some experiments at Brighthelmston some months before, but the time I made the trials with you at Bromley-Lodge was in the autumn of 1805, or the spring of 1806, but I rather think the former period was the time.

I remain,

My dear Sir,

With much esteem,

Your's ever,

HENRY LAWSON.

43, Goswer-street, 26th Dec.

1808.

KNIGHT SPENCER, Esq.
Bromley-Lodge.

SIR,

SIR,

HAVING been engaged in the Volunteer service since the year 1798, and of course often present when large bodies of men were assembled in the field for manœuvre, it appeared to me that much time was lost in conveying the orders of the commander in chief, to the general officers commanding distant divisions; and the posting of officers at intermediate distances, to convey the orders to "march," "halt," &c. by waving a hat, appearing to me a very clumsy and uncertain mode, in 1801 I set about contriving what I now take the liberty to call my Anthro-po-Telegraph, which besides obviating the uncertainty just mentioned, I flattered myself in the event of an invasion, it would afford considerable facilities of communication throughout the country, as it combines with the certainty of every other mode of telegraphic communication, the very desirable qualities of simplicity and cheapness, and might be introduced into every corps in the service, without the addition of a single man, and with so trifling an expense, as not to be worth notice when compared with the advantages which I presume could not fail to result from the use of it, and which I need not here enumerate, as they will occur to the mind of every intelligent person.

As a proof of its simplicity, and the ease with which a perfect knowledge of it may be gained, I beg leave to state, that in the year 1806, I engaged indiscriminately four privates of the South Gloucester militia to assist me in making experiments on the Downs at Brighton, and after one hour's drill they made every signal with the utmost correctness.

It was suggested to me by an experienced naval officer, that my invention might be of great service in the navy, and
accordingly

accordingly in the spring 1806, I sent it to the Port Admiral's office at Portsmouth, where the telegraphic business is transacted, when several very satisfactory experiments were made with it, particularly one from the battery to the flag ship at Spithead, a distance of three to four miles, and every signal was easily understood and answered.

Before I enter upon the explanation, permit me to observe, that my signals, like those used in the royal navy, are numerical, and of course without limit as to the extent to which they may be carried, and with the assistance of Sir Home Popham's numbered dictionary, now generally adopted, every kind of communication may be made, and conversations on any subject carried on at a distance of from one mile to three or more, according to the circumstance of situation, weather, &c. &c. with the utmost certainty and celerity.

*Reference to the Engraving of Mr. Knight Spencer's
Telegraph, Plate VIII.*

Letter A represents the telegrapher in the position of attention, furnished with a pair of disks made of wicker, or basket work, about 18 inches diameter (with handles six inches long), painted white with a black ball in the centre, weighing about one pound each, and value together about six shillings.

The ten figures represent the numerals, No. 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0.

B represents the signal of point or period, and is to be made

made at the close of every number, by bringing the disk in the right hand in front of the breast, placing that in the left hand at the same time upon the back.

The reason for placing a disk on the back, is, that when three or more stations are used, the middle station signals of *point* may be seen in the rear as well as in front, as all the other signals are.

C represents the signal of communication, and is made (when you wish to convey intelligence to your corresponding station), by the telegrapher facing to the right, and displaying one disk over the other.

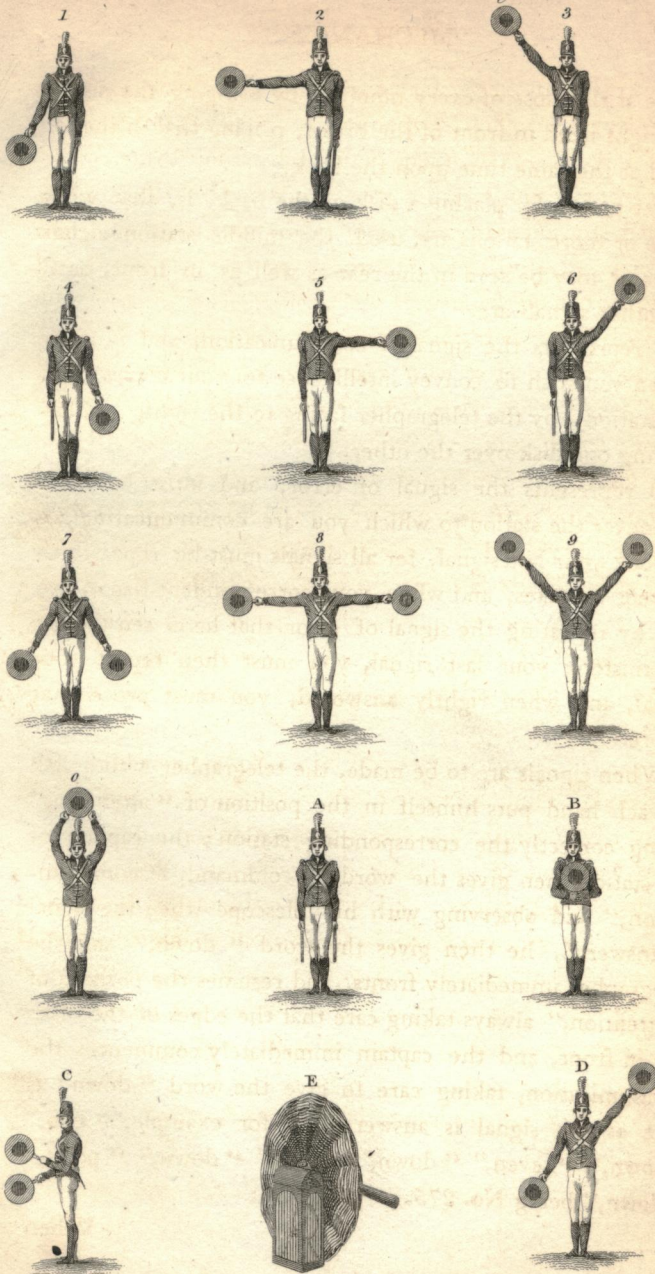
D represents the signal of error, and must be made whenever the station to which you are communicating has mistook your last signal, for all signals must be repeated to prevent mistakes, and when your correspondent has shown you by repeating the signal of error that he is sensible he has mistook your last signal, you must then repeat your signal, and when rightly answered, you must proceed as before.

When signals are to be made, the telegrapher with a disk in each hand puts himself in the position of "attention," facing correctly the corresponding station; the captain of the station then gives the word of command, "communication," and observing with his telescope when the signal is answered, he then gives the word "down," and the telegrapher immediately fronts, and resumes the position of "attention," always taking care that the edges of the disks are in front, and the captain immediately commences the communication, taking care to give the word "down" as soon as the signal is answered, as for example, "two," "down," "seven," "down," "five," "down," "point," "down," being No. 275.

When

Mr. Spencer's Anthrope Telegraph.

PL. 8.



Drawn by J. Eargy, Junr.

Engraved by S. Porter.

When you have finished your communication or intelligence, you may signify the same by making the signal of the cypher three times, and then "point."

I have lately used the telegraph in making night signals, and found it answer completely. For this purpose I used a lamp-lantern, with a reflector of about five inches diameter, glazed with green stained glass suspended upon the breast, and fixed steadily with tapes or strings tied round the body, and two smaller lamp-lanterns with reflectors about three inches, glazed with common plate glass, one of each is suspended to the centre of each disk by a pin, which allows it to hang perpendicularly in all the different positions and signals, and the difference in the colours of the lanterns sufficiently shows the angles of each and every signal. One of the disks and lanterns is shown at E, the lantern moves on a pivot fixed in the centre of the disk.

The signal of attention by night is the green light only, the signal of point is made by placing the white light of the right hand disk in front of the green light on the breast, the other on the back as in the day signals.

When the middle stations are used in night signals, the telegrapher at such station must have a green light to place on the back, and two other white lights to be placed on each side of the disks.

The lamp lantern shown upon the disk at E, is one that I have used for this purpose, and is the construction which appears to me the best.

I am, Sir,

Your obedient servant,

KNIGHT SPENCER.

*Bromley-Lodge, Jan. 12th,
1809.*

TO C. TAYLOR, M.D. SEC.

Further

Further Directions for Working the Anthro-Telegraph on Shore.

THE captain of each station must be furnished with a good telescope, to be fixed so firmly on a stand, as not to be shaken by the wind, and he must be attended by a person to make the signals (called the telegrapher.)

The telegrapher must front very correctly the station to be communicated with, (particularly in making signals by night), and he must take care that the disks when making a signal are displayed full to the front, at other times they are to hang down at arm's length, and the edges of the disks only are to be seen in front.

Stations must be fixed upon where the telegrapher can be distinctly seen from head to foot, and care must be taken that there are no obstructions in front, or objects in the rear, that may confuse the sight from the distant station.

The captain should be furnished with a *velvet paper book*, or journal, and a metallic pencil to take down signals; these are much to be preferred to pen and ink, as the writing cannot be effaced, and one pencil will serve 12 months.

When it is intended to express numbers, either at the beginning, the middle, or end of the question, answer, or communication, it is to be done by making the cypher signal before the number to be expressed, for example,

I want fifty men.
140 476 050 382.

Three hundred cavalry approach my right.
0300 149 78 498 571.

When it is intended to make signals by telegraph, according to Sir Home Popham's dictionary, make the number of the

the letter T, and "point," after the signal of communication, when it is intended to make a *fixed signal*, make the number of the letters FS, and point after "communication."

In making signals on shore by night, it will much facilitate the operations, if the stations are fixed upon before dark, and the telescopes fixed correctly to bear upon the spots to be occupied by the respective telegraphers.

The SILVER MEDAL of the Society was this Session voted to Lieut. JAMES SPRATT, of the Royal Navy, now resident at the Signal House, Teignmouth, for his Invention of a Homograph, or Method of Communication by Signals, on Sea or Land.

An Explanatory Engraving is annexed with his Explanation of the Method of making the Communication.

SIR,

WITH this you will receive a truly ingenious invention of Lieut. James Spratt, of the Royal Navy. This gallant officer in the glorious action of the combined fleet at Trafalgar, on 21st October, 1805, was on board his Majesty's ship *Defiance*, when engaged within pistol shot with a French 80-gun ship called *L'Aigle*, he plunged into the sea, swam to the enemy's stern, and entered the gun-room port alone, made his way courageously through the different decks, and succeeded in mounting the enemy's poop, where placing his
hat

on the point of his cutlas, he called out to his men to join him. In attempting to haul down the French colours, he was attacked by several of their grenadiers, whom he repulsed with success. He was soon followed by several of our jolly tars, and in the act of saving the life of a French officer who cried out for quarter, a musket was levelled by a Frenchman at his own breast, which he fortunately struck downwards, but his leg was fractured by the shot; he afterwards fought two of the enemy on his knees, who were quickly dispatched by his companions, and the French ship soon after struck. More particulars of this transaction are recorded in the XV. volume of the Naval Chronicle, page 193. I have the pleasure to add, that Lieut. Spratt after a tedious illness, has recovered the use of his leg, and now has the command at the signal post at Teignmouth, anxiously wishing to be again employed in more active service against the enemies of his country.

I have taken the liberty of sending this communication, and the account of his invention, unknown to him, knowing that the Society of Arts, &c. are generally disposed to encourage merit in every rank and situation wherever found.

M. S.

September 19th, 1808.

To C. TAYLOR, M.D. SEC.

Reference

Reference to the Engraving of Lieut. Spratt's Homograph. Plate IX. Fig. 1. ABCD.

This new, easy, and useful code of signals is to be performed with a white pocket-handkerchief, to be held in different positions with the body. Figure A, with the dotted lines, exhibits the whole of the numeral homograph signals at one view, (see the positions that the handkerchief is held in, and the figures marked). The first position from the right foot to the right hand is No. 1, the others No. 2, 3, 4, 5, 6, 7, 8, 9, and 0, follow in succession. When making 1, 5, 9, and 0, the handkerchief should be held by the diagonal corners, as generally prepared for wearing round the neck.

For making 2, 3, 4, 6, 7, 8, the opposite sides of the handkerchief should be gathered in each hand, the near extremity of the handkerchief to be held by one hand to the point of the shoulder.

In working the homograph the body should be erect, the positions steady, the handkerchief to be held well in front of the arms, and facing the person to whom you are to impart your intentions. The best place for showing signals from a ship, is in the chains, or on a lower deck port, as the white handkerchief exhibits a greater contrast with the black sides, and is of course better discerned.

When on shore, they should be made from the side of a green hill, or in front of some thick foliage, or hedge, or dark wall. The positions intended to compose the number of signals, should be made in succession. The person to whom a signal is made, should wave his handkerchief horizontally, to convince you that it is understood.

When the positions which compose the number of your signals are finished, you are to wave your handkerchief in

M

like

like manner. For example, persons who make use of the homograph, should arrange in their separate books, or from a telegraphic dictionary, every question and answer which may occur to them on any subject, as there is no limitation to the numbers. If the number prefixed to your communication be 1,000, you are first to make position No. 1, and keep it so until your consort answers it by waving his handkerchief, which informs you that it is understood, then you are to make the 0 three times distinctly, as shown at figure A, each 0 to be kept up until answered as before. Now your signal being made, wave your handkerchief, which informs your consort, that he is to refer to his book for the purport of the signal No. 1,000, which may either refer to a distinct word in dictionaries numbered alike, or to a whole sentence in conversations, premeditated and inserted in books formed for the purpose.

When you wish to commence a communication by signals, you are to display the handkerchief in the manner shown at fig. B, which is called the signal of attention, and your consort is to display his in return. The person who displays first, has a right to begin the communication, and to prevent confusion, it is to be displayed at the commencement of every signal.

If by any accident your attention should be called off, and you did not comprehend the whole of a signal, by holding the handkerchief as in fig. C, you may demand a repetition. This signal is called the repeat. Fig. D, shows the following signals, by twisting the handkerchief regularly round one of the arms, and holding it in one of the positions marked 1, 2, 3, 4, viz. No. 1, affirmative; No. 2, negative; No. 3, interrogative; No. 4 to annul.

SIR,

SIR,

I ACKNOWLEDGE the receipt of your letter respecting my homograph, and beg leave to express the high sense I entertain of its having been noticed by so distinguished an institution as that of the Society of Arts, &c. I am positively the first inventor of it, and I put it in execution at the commencement of this war, on board his Majesty's ship *Defiance*, commanded by P. C. Durham, who did me the honour to express his approbation of it, and promised to bring it to the notice of his Royal Highness the Duke of York; but having the honour of getting a fractured leg in the battle of Trafalgar, I was prevented from getting attention to my homograph.

I have frequently conversed in this manner with my messmates at Spithead, from the green ramparts at Portsmouth, and from Plymouth Sound to the Hoe, which is still a greater distance. The conversation may be carried on at the distance of four miles by a common telescope.

The various uses to which the homograph may be applied at any moment, without expense, will not fail to attract the notice of persons of discernment. In active military service it will be found very important. It will be found useful to naval captains lodging on shore, who may thus communicate any orders with ease and accuracy to the commanding officers of their ships at anchor. Passengers on board ships in fleets may keep up a constant and friendly intercourse, to console themselves for the tediousness of a long voyage; and the country gentleman may, at a moment's warning, summon his neighbours to the sports of the field, or to the hospitable board.

If my homograph should meet with the approbation of

the Society of Arts, &c. and tend to the good of the community at large, I shall be highly gratified.

I have the honour to be,

With respect and esteem,

Sir,

Your humble servant,

JAMES SPRATT.

Teignmouth Signal-Post,

Dec. 26th, 1808.

To C. TAYLOR, M.D. SEC.

The following Certificates were received from LIEUT. GLANVILLE, R.N.; LIEUT. TAYLER, R.N.; Mrs. SPRATT, of Burlington-House; and Miss TAYLERS, daughters of the Mayor of Devizes.

(No. I.)

I do hereby certify, that being at Ryde in the Isle of Wight in the summer of the year 1806, I frequently conversed with Lieut. Spratt, by means of the homograph invented by him; and previous to the battle of Trafalgar, Lieut. Spratt conversed in this way with many officers at Gibraltar. I also certify, that I have heard from officers of the Brest, Cadiz, and Mediterranean fleets, that Lieut. Spratt was the inventor, and the first person who made use of such invention. Given under my hand this 10th day of Jan. 1809.

J. N. TAYLER,

Lieut. of his Majesty's Ship Spencer.

(No.

(No. II.)

We the undersigned do hereby certify, that being at Ryde in the Isle of Wight in the summer of the year 1806, we did frequently see Lieut. Spratt of the Royal Navy, conversing from the shore by means of the homograph invented by him, with Lieut. J. N. Tayler, then on board his Majesty's ship the Leopard, lying at Spithead. ANN TAYLER further saith, that she with many others saw it used with great success at Teignmouth.

Witness our hands, Feb. 2d, 1809.

MARY TAYLER,	} Devizes,
ANN TAYLER,	
MARGARET SPRATT.	

Wilts.

(No. III.)

This is to certify, that I, GEORGE GLANVILLE, Lieut. of the Royal Navy, saw Lieut. Spratt, then Master's Mate of the Defiance, conversing by means of a homograph from the ship Defiance, with Lieut. Nicholas on board the Malta, six or eight months previous to the Trafalgar action, and that they seemed perfectly to understand each other by the signals given.

Witness my hand this 30th day of May, 1809,

GEORGE GLANVILLE, Lieut. R.N.

The SILVER MEDAL of the Society was this Session voted to RICHARD WHITE, Esq. of Essex-Street, for his Invention of a File for Receipts and Letters. The following Communication was received from him, and a File upon this Construction is placed in the Society's Repository.

SIR,

I SEND herewith the model of a file for papers, which I think will be found preferable to any in common use. A voucher cannot be disengaged from the common file, without defacing it by cutting it off, or by removing many others to get at it; and to return it to its proper place is attended with more trouble and inconvenience. All this is avoided by the contrivance in the file now sent, the wire of which is passed through a cylinder, and fastened by a screw at the bottom.

When a particular paper or voucher is wanted, remove those which are above it from the cylinder upwards to the wire, which is first to be disengaged by unscrewing it, the paper sought for will then be the uppermost on the cylinder, and of course easily taken off; when that is done, return and fasten the wire as before, pressing down the papers from the wire to the cylinder. To return the voucher, the same operation is to be repeated, and the voucher restored to its proper place.

I am, Sir,

Your very humble servant,

RICHARD WHITE.

Essex-Street, Dec. 29th, 1808.

TO C. TAYLOR, M.D. SEC.

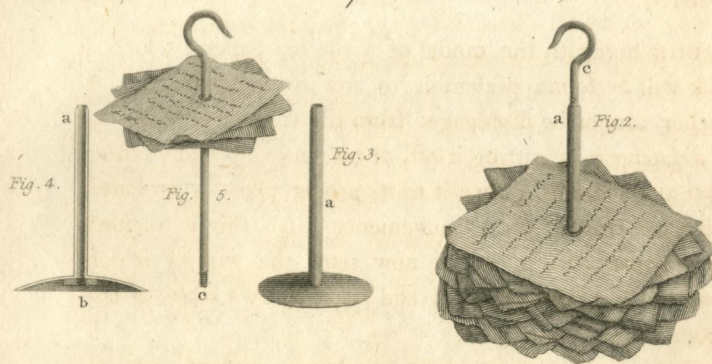
Explanation

Lieut. Spratt's Homographs.

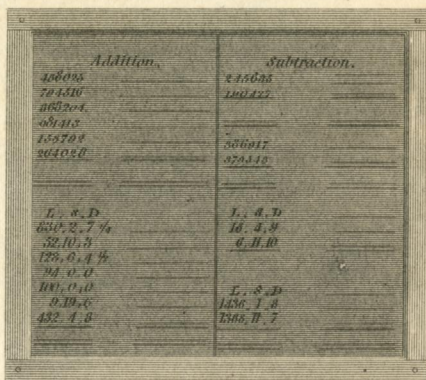
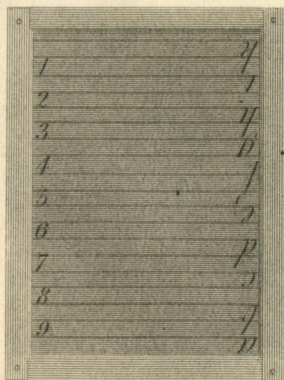
Pl. 9.



Mr. White's improv'd Letter File.



*M^r. Warren's engraved Slates to teach Writing
& Arithmetic.*



Explanation of Mr. White's improved Letter File, as shown in Plate IX. Figs. 2, 3, 4, 5.

This invention consists of a metal tube *a*, fig. 3, with a convex circular plate soldered to its lower end, to keep the papers from slipping off the file, and having attached to its under side a piece of metal *b*, fig. 4, with a screwed hole in it, to receive a screw on the end of the wire *c*, fig. 5, the other end of the wire being formed into a hook, sharpened at its point, to receive the papers as usual; when any paper is wanted to be taken off the file, (instead of taking off those above it, which cannot be replaced again without much loss of time and trouble, or which is still worse, tearing it off) the uppermost papers are to be slipped up towards the top of the wire *c*, which must be unscrewed, and with the papers upon it removed, as shown in fig. 5; the paper wanted may then be taken away, the wire replaced again into its tube *a*, and screwed fast, and the other papers drawn down the tube as before. The upper end of the tube *a* should be made conical, and its edges sharp, the better to suffer the papers to pass over it. A section of the tube and female screw *b* beneath is shown separately at fig. 4. The papers are shown in fig. 2, in the situation they are commonly placed upon the cylinder, with the wire within the cylinder.

The SILVER MEDAL of the Society and TEN GUINEAS were this Session voted to Mr. THOMAS WARREN, Jun. of Buckingham-Street, Adelphi, for his Invention of Teaching to Write on a cheap plan, by means of Copies Engraved on Slates.

The following Communication was received from him, and Slates Engraved with various Letters, Figures, and Designs, are reserved in the Society's Repository.

SIR,

I BEG leave to offer some engraved slates of my invention to the inspection of the Society for the Encouragement of Arts, Manufactures, and Commerce, humbly submitting to their consideration, whether they may be deemed worthy of reward.

The great utility of this article in instructing the children of the poor, particularly in the art of writing, has been amply proved in several respectable charity-schools at Bury St. Edmunds, also in many private families for the last nine months.

This invention occasions great saving in writing-paper, pens, ink, and labour in teaching.

In making use of these slates, the slate pencil is recommended to be placed in a quill, and to be held exactly after the manner of a pen, by which means the hand is made pliant, preparatory to the use of that instrument on paper.

Small Slates without capitals, which are the sort recommended to schools in general, are sold for fifteen shillings the dozen, by one of which all the children in a family may learn

learn to write, and with care it will last for ages. Small Slates, with capital letters, are sold at one guinea the dozen. They may be procured on my account from Messrs. Champante and Whitrow, Stationers, Jewry-street, Aldgate; and Messrs. W. and C. Child, Lower Thames-street.

The method I recommend in making use of my small Slate, with the two addition sums engraved upon it, is to cut off with the pencil the three lower lines for the first sum, then four lines, then five, &c. by which means the two sums answer the purpose of many; I have proved this Slate to be of great use in schools. The large Slate, with the first four rules of arithmetic engraved upon it, I recommend as a useful article in private families, as by it children may be exercised in those rules with very little trouble.

An addition sum may be cut upon a Slate, to do for the purpose of addition, subtraction, multiplication, and division, by setting the lines at a considerable distance from each other, and making the upper lines the largest numbers for subtracting, but it makes rather a complex article, and examples for children cannot be too plain.

I have prepared some Slates with designs engraved upon them for learning to draw from, but I do not consider this as a very important article.

I should have been happy to have attended personally upon the Society, but through confinement in business and my small means, I have taken the liberty to send the Slates by a friend.

I am, Sir,

Your humble servant,

THOS. WARREN, JUN.

Bury St. Edmunds,

Jan. 4th, 1809.

To C. TAYLOR, M.D. SEC.

Certificates

Certificates were received from Mr. JOHN POWELL of Islington, and sixty other respectable persons, stating that they think Mr. Warren's Invention is likely to prove of considerable public utility.

Reference to the Engraving of Mr. Warren's Slates for teaching Writing and Arithmetic. Plate IX. Figs. 6 and 7.

Fig. 6 represents one of the smaller Slates, on which the numerals 1 to 9 are engraved on the Slate; faint horizontal parallel lines are drawn across the Slate, within which the scholar is to copy with a Slate pencil the figure at the beginning of that line; he may at discretion proceed to copy one figure in the different lines on the Slate, or to copy each figure in each line. When the lesson is completed and examined by the master, the figures made by the scholar with the pencil are rubbed out, and he proceeds with a second lesson as before.

By reversing the Slate, the small letters of the alphabet will serve for lessons in a similar manner.

Fig. 7 shows one of the larger Slates with examples in addition and subtraction, these lessons may be varied at the pleasure of the master, by the methods pointed out in Mr. Warren's preceding letter.

The master of a large school may have each Slate engraved in different figures, by which means an infinite variety of lessons may be furnished.

FIFTEEN GUINEAS *were this Session voted to Mr. J. BROCKBANK, of Whirlpipin, near Whitehaven, in Cumberland, for an ingenious Machine for making Slate Pencils.*

The following Communications were received from him, an Explanatory Engraving is annexed, and a Model of the Machine is preserved in the Society's Repository.

SIR,

IN the month of July last I introduced myself to you at the Society of Arts, &c. for the purpose of exhibiting some specimens of what I believed to be a new and ingenious manufacture. I then requested your advice respecting the proper mode of bringing the invention before the Society, and if it met their approbation of procuring some gratuity, honorary or pecuniary, for the inventor. In compliance with your information, the inventor has constructed a model of the machine, which will fully illustrate to the Society on a small scale its mode of operation on the larger one of the mill he has lately erected.

To place the claims of this invention in their proper light, it may not be improper to state the causes which first led Mr. John Brockbank, the inventor, to turn his thoughts to the construction of this sort of machinery, and to erect a mill for the purpose of making slate pencils. The specimens which accompany the model now sent will be convincing proofs of its efficacy, and of the superiority of his pencils over all others hitherto manufactured.

In the vicinity of Mr. Brockbank's residence on Black Combe, a lofty mountain in the seigniorship of Millom Cumberland,

berland, there is an almost inexhaustible quarry of that species of shale or shiver, peculiarly adapted for this purpose. Having proved this, and being informed that an immense quantity of such pencils were annually imported into this kingdom, under the name of Dutch pencils, he conceived the idea, that the intervals of leisure which his occupations in husbandry allowed him, might be profitably employed, if he could discover some mode of manufacturing pencils that should rival in cheapness, and excel in other respects, those procured from foreign markets. I have no doubt you will agree with me in thinking, that in the outset this did not seem an easy undertaking, but it has nevertheless been executed with complete success, more particularly when the cheapness of the imported pencils is considered. The encouragement the sale has met with wherever they have been tried, namely in a few of the large towns in Cumberland, Westmoreland, and Lancashire, soon occasioned a greater demand than the inventor was able to supply, whilst the power of the machine was only impelled by the hand. At that time the long pencils were sold at ten shillings, and the short ones at five shillings per thousand, and he was able to make about twelve hundred of the two sorts per diem.

Now that the machinery is worked by water, no greater rapidity of execution is acquired, but it is no longer a work of much bodily exertion, and may be managed by boys; so that if he continues to receive encouragement, he may be induced to extend his machinery, by the addition of more frames, to a larger water wheel, so as to answer the most extensive demand. Humble as this species of manufacture may at first be thought, yet much might be said to show that it has stronger claims to attention than a superficial view of the price and nature of the article might suggest. There
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is a great and constant demand for such pencils in every village of the kingdom; and that demand has hitherto been supplied by importation from foreign markets. Perhaps any further remarks of mine may be unnecessary on this subject. I have only briefly stated the grounds upon which the inventor respectfully solicits attention, he being fully aware, in his remote situation, that nothing is more likely to aid his views, by calling the public attention to his manufacture, than the honourable notice of the Society instituted for the Encouragement of Arts, Manufactures, and Commerce.

If the Society should wish for any additional information respecting the machinery and its operation, more than what the description accompanying the model conveys, I beg leave to refer them to Mr. Miles Brockbank, Coopers'-court, Cornhill, who has seen the machine at work, and can give every information respecting its power and execution.

I remain, Sir, with great respect,

Your most obedient servant,

JAMES SATTERTHWAITE,
Rector of Whicham.

*Bootle Rectory,
March 1, 1808.*

TO C. TAYLOR, M D. SEC.

SIR,

PLEASE to have the goodness to observe, that my present machinery is worked by a water-wheel of only seven feet diameter, fixed on one end of the axis; a small lever, projecting from the axis, presses down the jaws of a pair of pincers, the lower handle of which pincers is fixed stationary below

below the axis above-mentioned, and the upper handle is alternately pressed down by the lever, and raised by a crank at its extremity, which is counterbalanced by a weight above it. These pincers first cut the shale or shivers into proper lengths or slips, which slips are carried from thence, and one by one entered into the end of a circular sharp-edged tool or tube, something resembling that with which sadlers punch holes in leather; they are forced through this by means of another lever fixed in the axis of the water-wheel, which alternately presses forward the frame sustaining the pencil, and draws back the frame after such pressure by means of a wedge and wheel fixed upon another axle. The pencils are made in a circular form by their pressure through the hollow tube above-mentioned. I have sent specimens of the materials and pencils, in their different stages of work, to explain the business fully.

I am, Sir,

Your obedient servant,

JOHN BROCKBANK.

*Whitripin, in Whicham, near
Whitehaven, May 1, 1809.*

TO C. TAYLOR, M.D. SEC.

Description of Mr. Brockbank's Machine for manufacturing Slate Pencils.

Mr. Brockbank's machine is shown in perspective in Plate X, where AA is the axis or shaft of a water-wheel, which gives motion to the machinery; aa are two cams or tappets projecting from the axis to work the nippers or pincers B; the lever x, which is part of the lower jaw, is lifted up by two rods, which connect it with a heavy lever or counter-balance

Mr. Brockbank's Machine for making Slate Pencils.

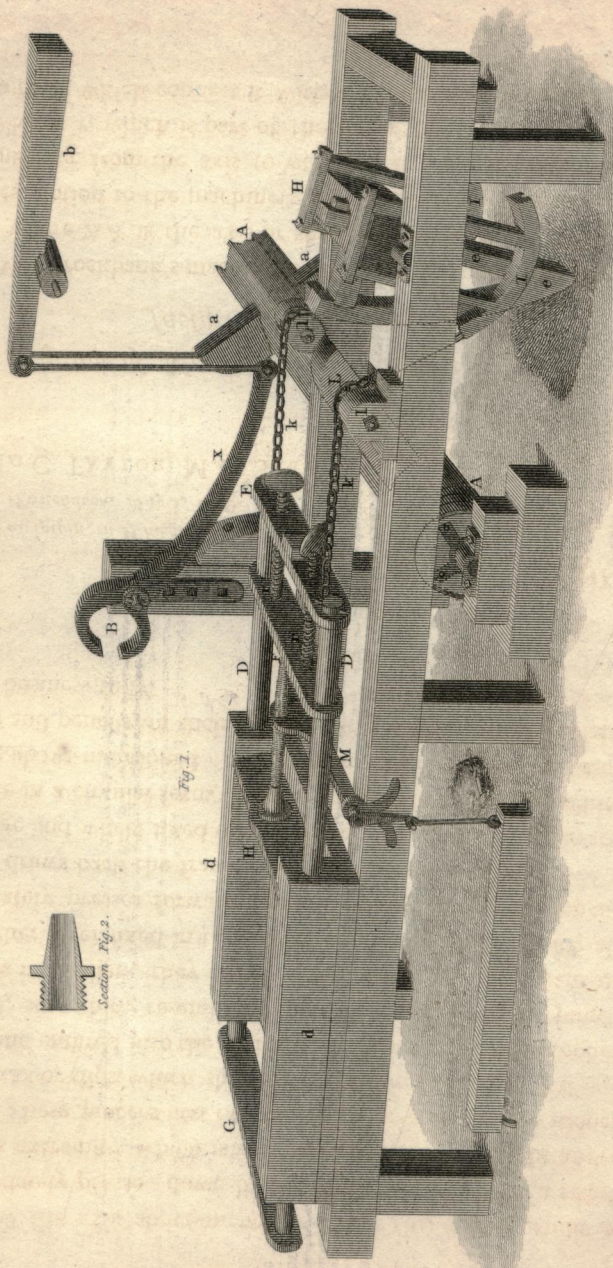
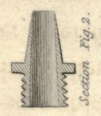


Fig. 1.



Drawn by J. Facey, Junr.

Engraved by S. Prior.

balance *b*, and by this means the nippers are opened; the upper jaw is fixed to a post firmly placed in the ground; as the water-wheel revolves the cam *a* alternately presses down the lever *x*, and closes the nippers; and when the cam *a* has passed by, the weight of the lever *b* opens them again. *L* is another cam, much larger than the former, (fixed into the same shaft *AA*), for giving motion to the other machine: *DD* are two cylindrical rods, connected by the cross pieces *EFG*, which form a frame; the rods *DD* slide through holes or sockets in two beams *dd*, fixed to the frame of the machine; between these two beams an iron plate *H* is fixed, having a hole in the middle to receive the screw of the cutting tube shown in section in fig. 2. The frame is pushed away from the axis *A* by the cam *L* meeting the cross-bar *E* of the frame, and it is brought back again by the cam moving a crooked lever *eee*, which is fixed on an axis *H*. *II* are two arcs of circles of segments of wheels, fixed on the same axis *H*; two chains *kk* are fastened to these, and passing over two pulleys *ll*, are fastened to the front piece *E* of the frame; by these chains the motion of the crooked lever *ee* is communicated to the frame, so as to draw it back ready for the next stroke of the cam *L*. *M* is a cross-bar moving upon two centres, having a notch or gap in the middle of it, for one end of the shiver or piece of slate to rest upon; at one end of this bar is an arm, to which is hooked one end of a beam or weight, the other end resting upon the ground; the frame in its action presses down this cross-bar, but it is again replaced in its upright position by the action of the weight upon it.

The materials intended to make the pencils are laid in a convenient place, the person employed generally sitting to the work. In the first operation of the mill, the pincers *B* very expeditiously pinch or split the materials into slips or lengths,

lengths, from thence they are received by a person standing to attend the frame, and between the frame and the pincers, one of the points of the slips or lengths, so split or pinched by the pincers, is put into the cutting tube; and the other end rested in the notch of the cross bar M, the revolution of the water-wheel now forces the frame forward and forms the pencil, by thrusting the slips or lengths before-mentioned through the cutting tube (which should be made of excellent steel), which is screwed into H, the chips or refuse slate falling down under the cutting tube. The pencils are then in their second stage, and in order to reduce them to a proper size, the first cutting tube is unscrewed or taken out, and another the size of the intended pencil is fixed in its place, they are forced through this smaller cutting tube by the same operation as before, and the slate pencil is then completely finished, of a beautiful cylindrical form, ready for use.

The two screws *rr*, which either advance or draw back the cross piece F, are to regulate the forcing frame, that all the pencil may be forced through the cutting tube, when the cam L upon the water-wheel axis AA leaves the forcing frame. The water-wheel of the mill is only 7 feet diameter, yet it has sufficient power to work both the pincers and the forcing frame at the same time.

The SILVER MEDAL of the Society was this Session voted to Mr. ROBERT SALMON, of Woburn, for his Invention of a Machine for securing Persons attempting Depredations, without affecting their Life or Limbs.

The following Communication was received from him, an explanatory Engraving is annexed, and one of the Machines is reserved in the Society's Repository.

SIR,

I BEG leave to submit to the Society of Arts, &c. a Man-trap, which I hope will meet with their approbation. To those who live in the country it is needless to explain the frequency of petty depredations committed on gardens, orchards, &c. and which are sometimes very vexatious. Few persons would like to endanger the life or limb of the depredator by setting the common steel man-trap, yet it is presumed there are but few who would not wish to detect the offender. The instrument which I have the honour to submit to the Society is for the purpose of catching and holding the person without injury. At the Agricultural Meeting at Woburn last summer, an ingenious invention for a similar purpose was produced by Sir Theophilus Biddulph; it consisted of a wood box, containing two springs in iron barrels, and two chains passing over and round them; when this was set, the chains were withdrawn from round the barrels and extended to a certain distance. A trigger then kept the trap from closing, the whole was then covered over with thin iron plates, so that if a person set his foot on those plates his leg dropped into the box, and the chains closed round it

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and

and held the leg; but as the box was about three feet square and a foot deep, it was requisite that it should at setting be let into the ground, which would be a work of considerable labour, and when done it would be difficult to dispose of the stuff from the hole, or to conceal the trap, and as the whole apparatus was cumbersome and expensive, it appeared to me not to be well applicable in practice.

I think it right to give this explanation in justice to Sir Theophilus Biddulph, from whom my idea of the utility of something of the kind arose, as also to show the difference between his invention and the trap I have made, which is so very simple as hardly to require explanation. When set it only requires that the two keys be withdrawn, and that the trap be covered with a few loose leaves or mould. To the trap I have attached a piece of chain and a screw to be screwed into the ground, so as to prevent its being carried away; but against any person that may be caught such a precaution is perhaps unnecessary, for any person who is caught will find the jaws of the trap close so fast on the leg that he cannot drag the trap far without great pain, and will consequently be glad to stand still and to call out for relief. For the convenience of explanation I have applied mufflers to the jaws of the trap, so that any person may put in his leg without the least inconvenience. I have even tried it without, yet, though void of danger, the sensation is not pleasant. The muffle will of course be omitted when set for use, as it is not then necessary to guard against a little inconvenience, otherwise the springs might be made weaker.

I remain, Sir,

Your most obedient humble servant,

ROBERT SALMON.

Woburn, Feb. 12, 1809.

TO C. TAYLOR, M. D. SEC.

P. S. Permit me strongly to recommend to the notice of the Society the earth screw attached to the trap, as excellent for the purpose of fixing any thing steadily in the earth, this screw is far superior to the common way of driving an iron point or stake therein.

I have employed it for several years in fixing cross-staffs and other surveying instruments with great advantage. The very act of driving a spiked instrument into the earth leaves it loose with some play or movement, which prevents it from being easily secured; but with a screw of this kind at the bottom of the instrument it is firmly fixed in the ground, and a turn of the screw will again fix it, if it should by any means be moved or loosened. It may also be screwed into the ground with any instrument upon it, which would be spoiled by the act of driving it in.

Description of Mr. Salmon's Man-Trap, which detains the Offender, without injuring or maiming him.
See Plate XI. Fig. 1.

The principal figure in the fore-ground of Plate XI. is a perspective view of this machine. Fig. 1. ABC is a frame of wrought iron, about 18 inches square; it has an eye projecting from it to receive a short chain, the other end of which is fastened to an iron screw, shown separately at D, screwed into the earth by the key or handle E; this screw is about 14 inches long, and, when screwed into hard ground, will hold so firmly, that there is no danger of its being drawn out, even by two or three men, and having a small square end, it cannot be turned without the key or handle E; so

that an offender would find it extremely difficult to remove the trap: $ee fg$ are two iron frames moving on centres in the frame ABC; these frames have a constant tendency to close together, by means of two springs pp , fixed in the frame AB, and acting against pins projecting from the upright sides of the moveable frame ee ; kk are two small iron rods jointed to the upper rod of the moveable frame g , and passing through small locks ll , fixed to the other frame f . These locks contain clicks which are pressed by springs into the teeth, as may be seen upon the rods kk , so as to prevent the two bars fg from being drawn asunder when they have been closed by means of the springs pp . The internal mechanism of the locks is explained by figures 2, 3, on a larger scale at LM, in the same plate; one side of the lock is supposed to be removed to exhibit its interior parts, where k represents the rack, or that part of the rod which is cut into teeth, r is the click, which engages the teeth of the rack, and prevents its being drawn through the lock: the click is pressed against the teeth of the rack by a spring, which is plainly seen in the figures; the locks are attached to the ends of the bar f of the moveable frame, by the bar passing through the locks, and when the lids are rivetted on it is confined in such a manner that it cannot be got out. But as it is necessary to open the bars fg , and draw the clicks back from the teeth of the racks, Mr. Salmon has contrived two different methods of accomplishing this object. Figure 3, M is that which is used in the model left at the Society's Repository, a small key or screw S is put down through a hole in the lid of the lock, and is received into a hole lapped with a screw in the click: by turning the screw it lifts the click out of the teeth of the rack; so that the moving frames fg can be opened apart from each other, till they lie flat upon the frame AB. The iron cross m is then put between the two rods fg , the screws

S of

S of the two locks are to be withdrawn from the locks, and the trap is set for use. If an offender should place his foot within the square of the frame, he would tread down the cross *m*, and having thus removed the obstruction, the two frames *ee fg* are closed together by the springs *pp*, so that the bars *fg* inclose his leg, and the clicks in the locks prevent the bars being opened without the screws *S*. In some of the machines which Mr. Salmon has made since the model was deposited with the Society, the locks are made like figure 2, L, where a common key is to be introduced, and, when turned round, catches the tail of the click; it may have wards to prevent the using of a false key, though no wards are shewn in the plate. Part of the screw *D* for securing the trap from being carried away by depredators, is shewn on a larger scale at *N*, in order that the peculiar form of its threads may be better seen, which fix it firmly in the earth. Such screws would be very serviceable in fastening horses at grass, &c.

TWENTY GUINEAS were this Session voted to Mr. ROBERT SALMON, of Woburn, for a Method of constructing commodious Houses with Earthen Walls.

The following Communication was received from him, Explanatory Engravings are annexed, and Models of the Apparatus are reserved in the Society's Repository.

DEAR SIR,

HAVING for some years past practised at this place the art of Pisè, or constructing walls with earth, and having in
 N 3 consequence

consequence been several times, both publicly and privately called on to communicate my observations thereon, I have been led to consider that the best mode of generally communicating what I know on the subject would be through the medium of the Society of Arts, &c. I have accordingly, by the waggon, forwarded a case containing a model of my frames and apparatus for performing the work, with every particular in my power to give, for the information of any persons inclined to build in that way, and they will I hope, be found worthy a place in the collection of the Society.

To such as may be inclined to see specimens of this work, and may not have an opportunity of going far distant from London, I can recommend a house and other works built, and some of them inhabited by my brother, Mr. William Salmon, Builder, at Henley-Hill, near Barnet, Herts.

I have the honour to be,
The Society's, and your most obedient Servant,

ROBERT SALMON.

Woburn Park, Dec. 8th, 1808.

TO C. TAYLOR, M. D. SEC.

*Description of the Engraving of Mr. Salmon's Method
of building Pisè or Earthen Walls.*

Fig. 4. of plate XI. is a perspective view of the apparatus or moulds, in which the earths are rammed to form a wall. The mould consists of two long planks *Ff*, twelve feet long, twenty inches broad, and one inch thick, each made in two breadths; they are strengthened by several pieces of wood nailed across them. Holes are made through these
pieces

pieces of wood at top and bottom, to receive iron bolts, which hold the two boards parallel to each other, fourteen or sixteen inches asunder, which is the thickness of the wall intended to be formed between them. The bolts have a large head at one end, and a key passes through the other, to keep the planks together. When a wall is to be built, the foundation is laid in brickwork, which is carried about nine inches above the ground, upon this brickwork the planks are placed and bolted together. Two boards, like that shown at G, are placed between the planks at the ends, to form the ends of the mould; these boards are placed between the two bolts *aa*, which are seen close together at the end of the moulds, and are held fast by that means; the earth is now to be rammed in between the moulds, by the rammer with an iron head X. When the mould is filled with earth and well rammed down, the keys are to be taken out of the bolts, and the bolts drawn out; the planks are then removed, and put together again, a length further upon the wall, the bolts at the end, being put through the holes left in the wall, only one of the end boards is now put in, and the ramming proceeds as before; in this manner straight walls may be built of any length, and when the lower course is finished, then the mould may be taken to pieces, and put together again upon that course, the lower bolts of the frame being put through the bolt holes, which the upper bolts made in the wall at the first operation, to insure that the upper part of the wall is in the same place, and exactly over the lower. When a wall is to be built thinner than usual, a block of wood must be placed under the head of each bolt, so as to diminish the space between the planks.

When the angle walls of buildings are to be made, the apparatus is put together, as shown in the plate; four of the

planks are put together to form a right-angled mould, one end of each of the planks F and H is furnished with double bolts, the other ends have each two eyebolts fixed into them, as shown separately at *b d*; then a bolt *n* connects the two moulds, so as to form a hinge; the planks are kept together, so as to be perpendicular to each other, by a long iron rod K, hooked into eyebolts fixed in the planks. The outside planks of the mould are joined together in a different manner, see fig. 5, that of one frame being longer than that of the other, and has two pair of holes through its end O, to receive the bolts *t t*, which are fastened to the ends of the other shorter plank, and the keys are put through the ends of the bolts, to secure the planks together; a piece of wood P is occasionally placed between the end of the short plank and the side of the other, to increase the space between the planks, to make a thicker wall, the two bolts at the end of the plank being received into the notches in the piece of wood, and these bolts are then put through the holes Z Z of the long plank. In building the angle wall, it is necessary that the vertical joint formed between each mould should not be over one another, but arranged in the same manner as the joints of brickwork; this is accomplished by making the lower course of wall upon the brickwork only half the length of the mould, which is done by placing the end board G of the mould in the middle of it. The next course over this is to be made the whole length of the mould, the next one only half, and so on, as shown in the figure.

Improved

Improved Moulds and Description of making Earth Walls, by Mr. R. Salmon of Woburn, Bedfordshire.

The model of the frame in possession of the Society is made to a scale of an inch to a foot, the frame at large is made of $1\frac{1}{4}$ inch deal, ploughed and tongued together. The bolts and pins or keys of iron, as are also the plates on the holes in the sides of the frame. These plates are put to prevent the keys from cutting into the wood, and the holes from gulling and wearing.

This sort of mould is calculated for making walls, either fourteen or sixteen inches thick, and the model (or perspective view of it in the distance of plate XI.) shows how the mould is to be applied for making the corner of a building of the sixteen inch wall; the same moulds may be applied for a fourteen inch wall. *ff* being the outer sides. *FH* the inner sides. When employed for straight walls, or making good between the corners of buildings, the two returns of the frames are used in pairs, *ff* and *FH* make two sets of frames. The board marked *G* must be of width equal to the thickness of walls to be made, and are for the purpose of stopping the earth, and making ends or jaumbs to doors or windows, or wherever wanted. The piece of wood *P* is two inches thick, and is for the purpose of making out the external sides of the moulds, from a fourteen inch to a sixteen inch wall: by introducing this piece between the two sides *ff*, and putting the fixed iron pins in the outer holes *ZZ*, and taking away the blocks under the heads of the outer bolts, the sides of the frame will then be sixteen inches, as under, and thereby adapted for a sixteen inch wall. Fig. E are pieces of wood about $1\frac{1}{2}$ inch square, and cut to the length

length of the thickness of the wall, and are for gauges to be applied on top of the bolt, to keep the keys from drawing the sides too close together.

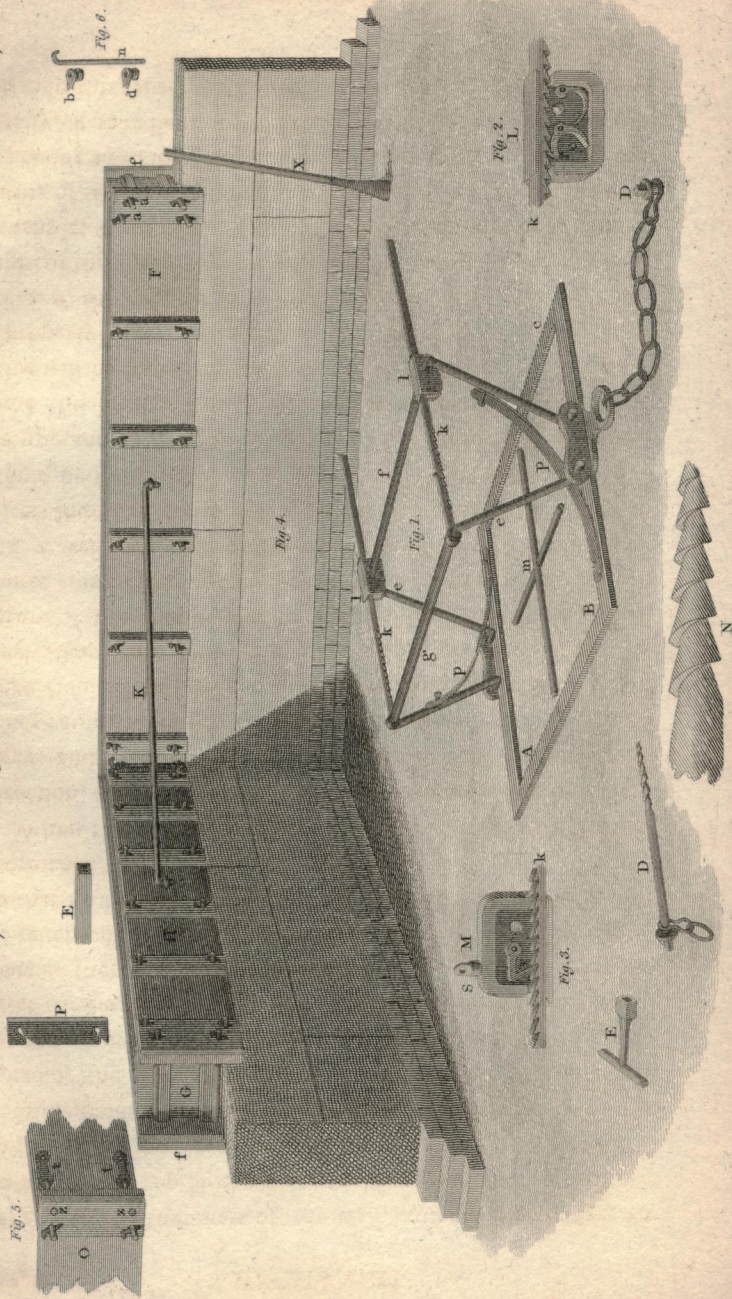
In beginning the wall, some of them are necessary at the bottom, the more firmly to support the frame on the brick or stone work. They are then worked into the wall, and, after the frame is taken down, drove out. After the first course, they are only necessary to the top irons, and may be taken out as soon as the earth is rammed up near them, so that no holes are left in the upper courses of the wall, more than the bolt holes.

When these frames are used, one side is placed in such a direction, that the front or end may be required to be taken away, and then by means of the angular iron brace K, the other return is sure to stand at right angles with the first. Care should then be taken, in the first course, to set the sides level, that being done, the other upper courses, from the nature of the frames, and manner of using them, must of course come upright and level without any particular care, and a wall being properly began, cannot well get wrong. After the first course of a building is done, the moulds should be moved to another, and so on till all the courses are up, and as the top holes of each preceding course become the bottom holes in the succeeding ones, no difficulty will be found in fixing the mould after the first course is properly done.

Fig. 6. shows the iron pin and staples that keep the internal angle of the frame together. K, fig. 4. an iron stay to set the returns at right angles. This is only wanted where other means of setting the building square is not to be obtained.

Having described the frame, and means of applying it generally, it may be necessary to observe the following particulars in the process. Having carried one course round the building,

Mr. Salmon's method of Building Pile or Earthen Walls — & his Man Trap.



Drawn by J. Hargreaves, Junr.

Engineered by S. Porter.

building, it frequently happens that the top thereof becomes too dry to attach to the next succeeding course, and therefore it is advisable that, as soon as the frame is set for the succeeding course, a small quantity of thick grout, composed of $\frac{1}{4}$ lime, and $\frac{4}{5}$ earth, be poured on top of each course, immediately before the first layer of earth is put in. A very small quantity is sufficient, and will add much to the strength of the work, by cementing the courses well together at the joints. The workman should also, with the corner of his rammer, in ramming home to the upright joints, cut down a little of that part of the wall, up to which he works; this will make the upright joints key together, and unite in a solid manner. Having thus proceeded and got up the walls, the next thing will be to stop the bolt holes, with mortar made $\frac{1}{4}$ lime and $\frac{3}{4}$ earth the same as the wall.

The earth proper for this work should be neither sand nor clay, but partaking of both. Clay is particularly objectionable, as is also chalk, or calcareous earth of any sort. Sand is also not proper, unless accompanied with some binding quality: the bolder and coarser the sort of earth the better. When used, it should retain no more moisture than just to make it adhere together, under the pressure of the thumb and finger. Notwithstanding earths bordering on sand appear to make the strongest work, nevertheless good earths may often be found in parts that do not abound with sand. Those that abound with a mixture of grit or fine gravel are generally the best. Having provided proper earth, as much should be put in each layer as to form about an inch and half when compressed by ramming.

The rammer X should not be more than half an inch wide on the edge, in order that it may more forcibly compress every part of the earth, which a flat rammer would not do so well.

In

In making the walls, about three inches in thickness of loose earth should be put in each course, which done, the same, by means of a trowel made for the purpose, is drawn back and cleared from the face of the wall, and the space then filled up with the facing composition, forming on an average about one inch in thickness; the whole then is firmly rammed, (in which, and properly preparing the facing stuff, much depends the perfection of the work,) till it is quite hard, when it will be compressed to about one inch and a half in thickness. The common facing stuff is composed of lime one part, and earth, the same sort as used for walling, three parts. The lime and earth mixed and slacked together, the same as for mortar. The more it is slacked and wetted the better, provided time can be allowed for it again to dry and pulverize, so as to be fit for ramming. The better sort of facing stuff may have a small quantity more of lime in it.

The foundation should be of brick or stone, carried up nine inches above the ground, and if a plinth is to be shown, then one course above the same should be of brick or stone, to prevent the water that might lodge on the plinth from damaging the earth wall.

The proper season for performing this work is any time that the earth is to be procured sufficiently dry for the purpose; the more early in the season the better, in order to give it time to dry before finishing, or if late it would be advisable not to finish till the year after it is built.

Windows and doors may be left in the walls wherever wanted, by fixing the head of the moulds and carrying up quoins to form the same: in erecting which some bond timber should be laid in coarse mortar and rammed in with the earth. Lintols may also be laid at the proper height. This method is cheapest, where only one window or door of a
size

size is wanted, but if many, the readiest way would be to make some rough frames of boards of width equal to thickness of walls, and place them in the situation of the windows and doors. When done the earth is rammed up to them, laying bond timber at the sides and lintols over them. In both cases the windows and door-frames are to be put in their places and fastened to the bond-timber, after the wall is up. The bond timber, lintol and plates, should be kept as thin as possible, in order to prevent any disagreement between the earth and timber in the shrinking or drying of the same. The bond timber about 4 inches by $1\frac{1}{2}$; floor or wall plates 6 inches by 2; lintols about 4 inches thick; and it may be worthy of notice that any slabs or rough stuff may be used, the earth being sure to ram close to it and keep it in place.

For common cottages, when the whole of the walls are up and covered in, the holes should be stopped with very coarse mortar, made the same as the facing stuff, but used wetter, and the wall then lime-washed over with lime and sharp sand, which should be made up in small quantities and used whilst hot. This may readily be done by adding a knob of lime and sand a little at a time as it is used.

For better kind of cottages the better sort of facing stuff may be used, and then, as before, the whole lime-whited; or if it be required to make the finishing as perfect as possible, the following is the best mode, viz. with water and a brush thoroughly wet and soak the face of the wall for two or three yards in superficie at a time; all which part, during the said wetting, should be continually rubbed and worked about with a hand float, till such time the face is rubbed smooth and even, by which the facing composition will so wash up as to become a pleasant regular colour, the face smooth and hard when dry, and not liable to scale off as a coat of plastering

tering would do. This finishing will be still improved by a small quantity of lime being put in the water used for soaking the face, and after the wall is well soaked and rubbed, as above-mentioned, there be thrown thereon with a brush some of the lime and sand, (such as used for lime-whiting,) and that also worked into the face; the face will then become as perfect and hard as stucco.

Having explained the frames as constructed by me for performing earth walling, as also the manner of finishing it, I beg leave to lay before the Society some observations on these, compared with the original French means and manner of performing the same, as described in the first volume of Communications to the Board of Agriculture.

The sides of the frames, as formerly constructed, were supported on joists or cross pieces of timber, which pieces were cut into the top of each course of walling. The sides were then kept together by upright timbers framed into the cross pieces or joists, and the tops of the upright pieces were wrested and held together by ropes going across the frame from one side to the other. In consequence of this construction, by experience I found much labour was lost in cutting the channels to lay the cross pieces in. These channels, after the buildings were up, took labour and materials to fill them in, and rendered the walls less strong. Also the difficulty of getting the frame rightly placed every time it was moved, and the elasticity of the rope across the top, made the whole very imperfect, so much so that all work done in that manner was untrue and unsound; as the rope, however tight it might be strained, would yield to a certain degree. The labour of moving was great, and when the frames were set, the cross ropes and uprights above the sides were much in the way of the workmen.

On examining the model I have the honour to send, it
may

may be seen that these frames being once set true, they require very little care afterwards: being kept together by iron bolts no elasticity can occur, and the earth will be as firmly compressed, as if rammed between two walls. No cutting away for cross pieces is required, nor any holes but the small bolt holes to make good; and as nothing sticks up above the frames, the workman cannot be impeded. In consequence of these alterations the work may be more cheaply and truly executed than with the old sort of frame.

Previously to entering into the expense of this sort of work, on my conceptions as to its advantage, it may be necessary briefly to state from whence such is collected.

About sixteen or eighteen years ago, the late Duke of Bedford directed a foreigner, who was then making some walls in Lancashire, to come and make some specimens here, and wishing to know how far it might be usefully introduced, I was directed to give attention, and every aid to the man employed. Accordingly frames of the old sort were made, exactly like those before described, and with them some specimens being made, the man returned. These specimens I considered were very bad walling, and in attending to the execution thereof, seeing sufficient room for improvement, I was directed further to practise it. Frames were then constructed like the model, and several walls erected, among which were some cottages now standing, and lastly, the house I now live in. This has been built about twelve years, and is a sufficient proof of the utility of the practice: the house being as close, warm, and dry in the walls, as if built of any materials whatever.

With regard to the expense of the walls of this sort, as labour is the principal part of the expense, and as in some places labour is dearer than in others, the best mode of
estimating

estimating it at different places will be from the quantity that a man should do in a day, and which I have found to be $1\frac{1}{4}$ yard superficial; in the common day's labour of ten hours.

At this place the expense may be estimated as follows :

	£.	s.	d.
Labour to making facing composition, fitting in and ramming to a 16 inch wall, where the earth is at hand (labourer's being 1s. 10d. per day) per yard superficial — — — —	0	2	2
Value of lime used in the composition rammed into the face of a yard superficial (lime being 8d. per bushel)	0	0	3
Lime and labour to rubbing up and finishing the outside face of the wall — — — —	0	0	3
Total finished and faced on one side	0	2	8
If a wall to a garden or otherways, and finished and faced on both sides, then add — —	0	0	8
Total for walls finished on both sides	0	3	4

At this place the value of a yard of brick-work is more than ten shillings, of walling only 14 inches thick, the bricks being 42s. per 1000, and lime 8d. per bushel; consequently the œconomy of the Pisè must appear; and the same difference will be found in any other place where lime and bricks bear the same price, and proper earth can be found at hand. But as attempting this sort of work, where it is not applicable, or improperly doing it, so as to lead to failure, may prevent its introduction where it would be useful, I shall endeavour to point out any precautions that have struck me, and every thing that has appeared to make against it.

Many persons have supposed, and it has been asserted, that

that almost any earth will do, but such is certainly very erroneous, for proper earth cannot in all places be found, and it being difficult to describe it, or to be sure when it is found, it seems adviseable, before the entering on any considerable work, that the experimentalist should first do a small piece, and let it stand with the top only covered for a winter at least.

It has before been observed, that the excellence of the work depends on its having due compression, as well as being of proper soil. If the compression be not perfect, although the soil be good, the walls will be unsound; and unfortunately it so happens, that when a wall is built and badly rammed, its imperfection cannot readily be observed, and further, the defect is likely only to be found but by its failure; and hence arises the greatest bar to its general introduction, for as it requires considerable labour to build a wall, it requires exertion to do it in proper season; and if the labourer be employed to do the work by task, it becomes his interest to get on and do it slightly, and if done by day, it will not advance so rapidly; consequently, in either way, it will require great attention from a careful overlooker.

From the foregoing comparative statement of Pisè against brickwork, persons unacquainted with building are inclined to suppose that the whole expense of the building will be in proportion thereto; contrary to this it only affects the walling,—the roof, floor, &c. remaining the same as before, excepting as it may reduce the quantity of bond timber and lime used in plastering the inside; this latter is less than when plastered on brickwork, the face of the wall being so much truer than brickwork.

A working drawing, on a scale of one inch to a foot, is left with the Society, for the inspection of any person inclined to construct the apparatus.

The THANKS of the Society were voted on the 8th of February, 1786, to Mr. BREAM, of Yarmouth, for his Present to them of a Model of a Boiler for the Use of Tallow-Chandlers and other Manufacturers of inflammable Matters. Explanatory Engravings on Wood are annexed, and the Model is reserved in the Society's Repository.

THE frequent fires which have lately happened in the different manufactories of tallow, soap, oils, varnishes, and other inflammable matters, in various parts of the kingdom, have induced the Society to publish a description of a model of a boiler presented to them by Mr. Bream, of Yarmouth, in 1786, of which no particulars had been heretofore given in the Society's volumes, and which appears well calculated to prevent the dangerous accidents which often occur from the use of boilers on the common construction.

The very little additional expense attending the make of boilers upon this principle, and the great degree of safety procured by this means, may perhaps claim the attention of government, or of the insurance-offices to insist upon their use in manufactories of inflammable matters.

The first figure represents a bird's-eye view of the boiler and receiving-vessel; the boiler has a double rim containing a channel, communicating by a spout with a vessel below, placed near the side of the boiler. In case the inflammable matter should boil over the inner rim of the boiler, it is received by the channel betwixt the inner and higher outer rim of it, and conveyed immediately by the spout into the

Mr. Prior's Escapement.

Pl. 32.

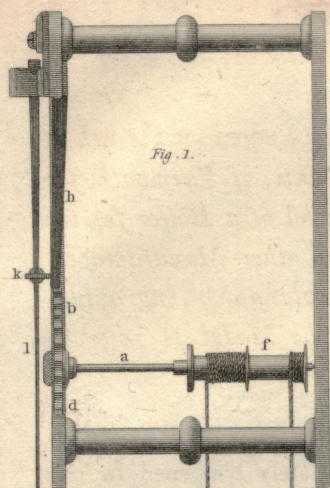


Fig. 1.

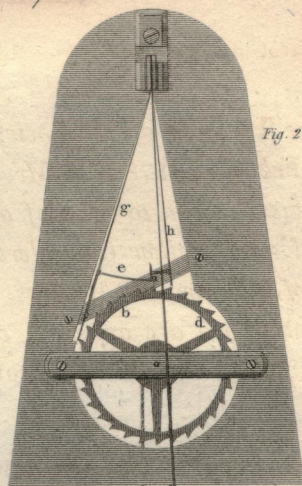


Fig. 2.

Mr. J. D. Ross's Eye Baths.

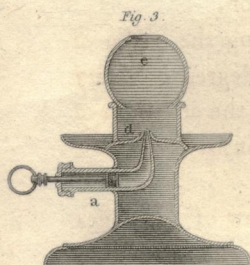


Fig. 3.

Section.



Fig. 4.



Fig. 6.

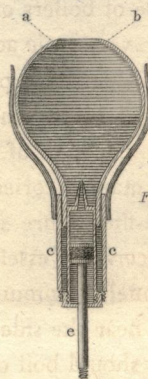
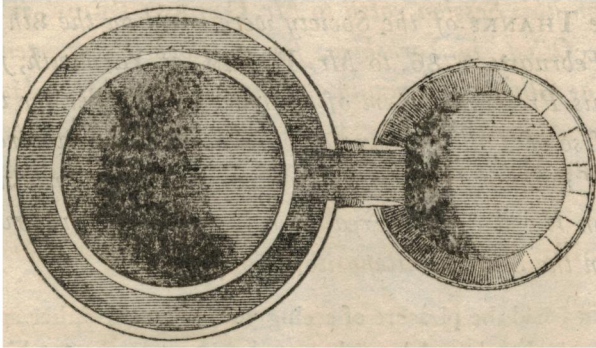


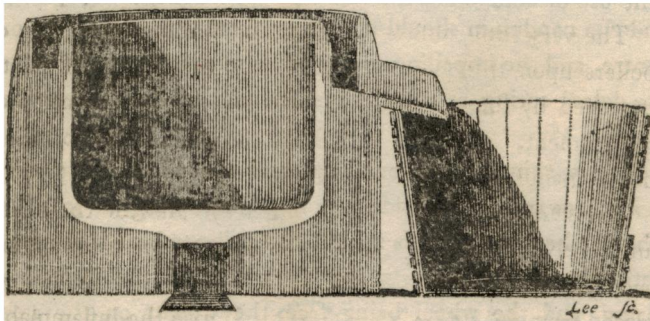
Fig. 5.

Section.

the vessel placed underneath, without risk of loss or damage.



The second figure shows a section of the boiler and receiving-vessel; in which it will be observed, that the channel which conveys away the fluid which accidentally boils over is much deeper on the side next the receiving-vessel, in order to accelerate the descent of the boiling fluid into it. The spout should be placed at some distance from the ash-hole and fire-place, for better security.



The SILVER MEDAL and TWENTY-FIVE GUINEAS were this Session voted to Mr. GEORGE PRIOR, jun. of Otley, in Yorkshire, for a Clock Escapement. The following Communication was received from him, an explanatory Engraving is annexed, and a complete Model is reserved in the Society's Repository.

SIR,

SINCE I had the pleasure of seeing you, when my father and I were in London, I have invented and made the machine now sent to your address; and I will thank you to lay it before the Society of Arts, &c. the first opportunity.

This Escapement will do for a pendulum of any length, and the friction is so small that it does not require any oil, for it may be made as little as the tooth of the wheel can sufficiently touch the impelling spring, and yet be properly scaped.

It is necessary that the detent spring, the impelling spring, and the pendulum should all spring from one right line or centre, and the impelling spring to be so much stronger than the detent spring as will always be sufficient to unlock the wheel.

The machine being wound up, and the pendulum put in motion towards the left side, the impelling spring unlocks the wheel, when a tooth falls against the pallet, where it remains until the pendulum returns; then moving the impelling spring, and the wheel being free, the weight on the axis causes it to advance while it escapes one tooth off the end of the pallet or spring, and another tooth is locked against the detent spring, as before, while the pendulum returns,
and

and the impelling spring again unlocks the detent; as the impelling spring moves towards the left, the resistance it meets with by the elasticity of the detent spring in unlocking is returned to it, so that there is no more power lost than what was caused by the pressure of the wheel against the detent spring; by which means it is freed from the loss of the maintaining power, which is evident in all detached escapements I have seen, by the pendulum or crutch, &c. touching a spring or lifting a lever to regain the position for unlocking the wheel.

I am, Sir,

Your most obedient humble servant,

GEORGE PRIOR, Jun.

Otley, Yorkshire,

April 13, 1809.

TO C. TAYLOR, M.D. SEC.

P. S. The screw in the pendulum rod is to adjust the machine when fixed up.

Description of Mr. Prior's Escapement. Plate XII.

Fig. 1, 2.

Fig. 1. is a side, and fig. 2. a back view of it, which is supposed to be taken from behind the clock; *a* represents the axis of the swing wheel, or last wheel of the train of the clock; *b d* is the swing wheel fixed upon it, having 30 serrated teeth, it is turned round in the direction from *b* to *d*, by the maintaining power of the clock, (in the model this power is supplied by the descent of a small weight attached to the end of the small line, which is coiled round the barrel *f*, on the axis of the swing wheel); *g* is a spring detent,

which locks against one of the teeth of the swing wheel, and this prevents its running down, by the action of the maintaining power; *b* is another spring detent, which is called the impelling spring; when left at liberty, it unlocks the former by pushing against the end of the small arch. Fig. 2. *e* fastened to the detent *g*, and thus removing the end of the detent which obstructed the wheel's motion; *l* is the rod of the pendulum suspended by a cock screwed to the back plate of the clock, a small piece of brass projects *k*, fig. 1. at right angles from the impelling spring *h*, so as to intercept the pendulum rod in its vibration, and at this place a small screw is put through the pendulum rod *l*, the point of which moves the impelling spring back; a small pin is fixed to the frame in a line between the point of suspension of the pendulum, and in the center of the swing wheel, against which the impelling spring stops when at liberty.

Supposing the pendulum to be vibrating backwards and forwards, and the wheel locked as in the figure, the pendulum swinging from *m* to *n*, fig. 2. the impelling spring *h* follows by its elasticity, until the pendulum *l* arrives at the perpendicular; at this period the impelling spring comes to rest against the end of the arc *e*, which it pushes back, so as to release the tooth of the wheel from the detent spring *g*; the wheel now moves round a very small space before it meets the end of the impelling spring *h*, and is stopped thereby, in the mean time the pendulum continues its motion the extent of its vibration towards *n*, when it returns, and arriving at the perpendicular, it meets the impelling spring *h*, and carries it along with it, until the tooth of the wheel which rests against it, escapes from the end of it, and another tooth of the wheel comes to rest against the spring detent *g*. The succeeding vibration of the pendulum repeats the same operation.

FIFTEEN GUINEAS were this Session voted to Mr. JOHN DUCKETT ROSS, No. 55, Princes-Street, Leicester-Square, for an Eye Bath, to clear the Eye from extraneous Matters, and to assist the Sight. The following Communication was received from him, an explanatory Engraving is annexed, and one of the Machines is reserved in the Society's Repository.

SIR,

BEING employed in the jewellery business, I have frequently suffered greatly from extraneous substances getting into my eyes, at different times, whilst I have been at work; and I have witnessed many accidents of a similar kind, which have happened to enamel-grinders, turners in metal, jewelers, lapidaries, and other artificers. These circumstances led me to attempt some means which would relieve such misfortunes, and also strengthen my own eyes, which were naturally weak. I have now succeeded in inventing an eye bath, possessing all these advantages; and which I beg leave to lay before the Society of Arts, &c. and hope it will be patronized by them.

The machine I have sent, forms an elegant ornament for a lady's or gentleman's dressing-room, and has been found very serviceable in use, of which I will furnish the Society with certificates.

I remain, Sir,

Your most humble and obedient servant,

JOHN DUCKETT ROSS.

No. 53, Greek-street, Soho,

March 6th, 1809.

To C. TAYLOR, M.D. SEC.

O 4

SIR,

SIR,

I THOUGHT it might not be improper to acquaint you, that Mr. Carpue has, according to a promise he made me, this day honoured my invention, by expressing his fullest satisfaction of it before the Medical Board; and that surgeon-general Keate, and Mr. Gillham, late chief surgeon to the Coldstream regiment, have, in consequence, favoured me with their orders; and I am further assured, that there is great hopes of my invention being generally adopted for the use of the army and navy.

I am, Sir,

Your obedient humble servant,

JOHN DUCKETT ROSS.

*No. 7, Old Belton-street, Long Acre,
March 14th, 1809.*

To C. TAYLOR, M.D. SEC.

Certificates were received from Mr. CHARLES SILBERRED, Optician, Aldgate.

Mr. RICHARD CARPENTER, Engraver, Aldgate, High-st.

Mr. EDWARD SEYMOUR, Engraver, &c. Greek-st. Soho.

Mr. WILLIAM WHITEFIELD, Engine-turner, Silver-st.

R. SQUIRRELL, M.D. Soho-square.

Mr. ROBERT SALMON, of Woburn.

Mr. J. C. CARPUE.

Mr. EDW. GEO. ADAMS, High-street, Mary-le-bone.

Stating, that they considered Mr. Ross's invention for the
eyes

eyes calculated to produce many excellent advantages to the public, and likely to become extensively useful.

*Description of Mr. Ross's Eye Bath. Plate XII.
Fig. 3, 4, 5, and 6.*

Fig. 4. Plate XII. is a perspective view of the eye bath, which is preserved in the Society's Repository. This apparatus is supported on a pedestal, or tripod. The bath part is represented on a larger scale in section, fig. 5, where *ab* represents a glass vessel, which has a neck at the lower end, and an aperture at its vertex, as is shown in the plan, fig. 6. to fit the eye. The neck is cemented in a brass tube *cc*, which is supported, by being screwed into an ornamental piece of brass work at the top of the pedestal. This tube encloses a common pewter syringe, the end of which is cemented into the neck of the glass vessel, as the section sufficiently explains. The handle *e* of the syringe, has a piece of brass screwed to it, which slides up and down, between two pieces of brass at *h*, in the pedestal, and a glass dish *i* is fixed below the frame, to receive any water which may be spilled by accident. When the instrument is used, the glass vessel is to be partly filled with water, (or any other liquor with which the eye is to be syringed,) so as to cover the orifice of the syringe; the patient then places his eye over the aperture in the glass vessel *ab*, and suddenly lifts up the brass slider at *h*, to which the handle of the syringe is fixed, so as to force the liquor contained in the syringe through that in the glass vessel into the eye; the liquor which covers the point of the syringe takes off the force with which the liquor would be thrown into the eye, so as
to

to render the operation not in the least painful. A more commodious, though less elegant form of the same apparatus, is shown in fig. 3. The syringe *a* is here placed horizontally, its point being turned up. It is soldered into a vessel of japanned tin, and the glass *e*, which is here globular, is laid loose on the japanned vessel *d*, which contains the liquor that surrounds the point of the syringe. This apparatus fig. 3. is intended to be placed on a table when used.

The THANKS of the Society were this Session voted to Mr. GILBERT GILPIN, of Old Park Iron-Works, near Shiffnal, for the following Letter, in addition to his Communications in the former Volumes of the Society, on his Improved Crane and Flexible Chains.

SIR,

PERCEIVING in the chains of the cranes a small degree of brightness upon those links which work vertical, and which was evidently caused by the angle, in which the former works from block to block, producing side friction in the grooves of the pulleys, I determined to try a set of the latter, with a concave rim on each side, to embrace the links which work flat, and thereby prevent those which work vertical from coming in contact with the sides of the grooves. In other respects, they are exactly similar to those mentioned in the Society's Transactions, Volume XXIII. page 273; and the following is the corresponding experiment tried with the same crane, chain, &c.

The

The crane was loaded with,	Look to hoist the loads, when reefed with the chain improved grooved pulleys,
First, 2000 lbs.	58 lbs.
Second, 1000 do.	30 do.
Third, 500 do.	16 do.
Total 3500 do.	104 do.

So that on the average of the trials, one pound raised 33,65 lbs. and, consequently, this crane works 7,68 per cent. more flexible with a chain reefed in the *improved* grooved pulleys than with the original ones; 28,87 per cent. more flexible than with an half worn, strand laid, tarred rope, of three and a half inches in circumference; and 37,51 per cent. more flexible than with the same chain promiscuously, as in the common way.

After upwards of six years practice in cranes and machines for raising coal and ore from mines, my former conjectures in regard to the safety, durability, and cheapness of chains when worked in grooves, (see the Society's Transactions, Volume XXV. pages 78, 79, and 80,) are in a great measure confirmed, for they do not even now appear to be one-third worn. Indeed, this method of making them renders chains much preferable to hempen ropes in every respect, and leaves nothing more to be wished as a substitute for that expensive article.

The war with Russia having nearly suspended the importation of hemp, round tarred ropes are advanced to fifteen pence, and patent flat ones to twenty-one pence, per pound, whilst chains continue at sixpence. Economy in the use of the former, has therefore become a matter of primary necessity, and in consequence, at those pits where we worked with one of each, the rope is now attached to the barrel, merely to
lower

lower the men in the morning, and hoist them up at night, remaining disengaged all the rest of the day; *the chain* (being braked down each time with celerity) *raising all the coal and ore.*

All the workmen in this *manufactory* consider chains, when worked in grooves, equally safe as the best hempen ropes; but *some* of those belonging to the *mines* pretend to think otherwise; I say pretend, because though they will not *descend* the pits by a chain, yet, to come to some scene of amusement upon the surface, two or three *ascend* by it together, *riding upon the loaded basket.* It is certain, therefore, that their opposition to chains arises from perverseness, and not from any idea of danger.

The great demand for chains and tire has induced me to become a manufacturer of those articles; and I am now selling the former, made of the best Shropshire iron, at sixpence, and the latter at three pence, per lb.

I am, Sir,

Your obedient humble servant,

GILBERT GILPIN.

Statements of the Calculations in the preceding Letter.

31,25	33,65	100	107,68
26,11	33,65	100	128,87
24,47	33,65	100	137,51

For further particulars relating to this first column, see Vol. XXIII. page 274.

*Old Park Iron-Works, near Shiffnal,
August 2, 1809.*

To C. TAYLOR, M.D. SEC.

We

We the undersigned tried the experiments mentioned in the preceding letter, and do hereby certify the same to be a true and correct account, as witness our hands this 9th day of May, 1809.

THOMAS BLAKEMORE, Clerk,	} In the employment of
JOHN BALL, Engineer,	
MICHAEL TART, Smith,	
JOSEPH FELTON, Forge-carpenter,	
	Messrs. F. W. and B.
	Botfield, at Old Park
	Iron-Works.

I have sent in a small box, by the Shrewsbury waggon, addressed to you, one of the pulleys and a piece of the chain with which the experiments alluded to were tried.

G. GILPIN.

The THANKS of the Society were voted to Mr. SAMUEL ROBERTS, Chairman of a Committee appointed at Sheffield for encouraging the Sweeping of Chimneys without the use of Climbing-boys.

The Society, anxious to relieve the sufferings of humanity, have attended with much pleasure to the Endeavours of the Inhabitants of Sheffield, and co-operate with them in their attempts to supersede the Necessity of employing Climbing-boys; they have, therefore, immediately on receiving the following Communication, ordered it to be inserted in their Volume, and an explanatory Engraving of the Machinery employed to be annexed.

The

The original Drawings are preserved in the Society's Repository.

The former Communications, made by the Society of Arts, &c. on the subject of sweeping Chimneys by Machinery, may be found in the 23d and 25th Volumes of their Transactions.

SIR,

I HAVE taken the liberty of sending herewith some papers, and a request from the Committee formed here for encouraging the use of machines in sweeping chimneys, that you will have the goodness to lay them before the Society instituted for the Encouragement of Arts, &c. It is the wish of the Committee here, that they should be published in that Society's Transactions, as appearing the most likely method of drawing the attention of the public to the subject. We think there will be a necessity of an Act of Parliament ; and, without that, no great good will be done in the business.

I am, very respectfully,

Sir,

Your obedient humble servant,

SAMUEL ROBERTS.

*Park Grange, Sheffield,
Oct. 12, 1809.*

TO WILLIAM TOOKE, ESQ.
Gray's-Inn.

SIR,

SIR,

IN making this statement to the Society instituted for the Encouragement of Arts, &c. respecting an object which has frequently engaged their attention, the Committee who make it are actuated by a desire of putting the Society and the public in possession of all that information which they have obtained from extensive experience, thereby enabling the Society to form a more accurate and just estimate of the degree of probability that there is of final success, than they otherwise might be able to do. As the Committee mean not to found any claim to reward, they have only been anxious to convey the information in the most convenient and ready way, without perhaps exactly observing the forms prescribed by the Society. The same considerations which have so frequently pressed themselves upon the notice of the Society, respecting boys employed by chimney-sweepers as climbers, operated on the minds of many individuals in this town, and upwards of two years ago gave rise to a general meeting, which appointed a Committee for the purpose of endeavouring to improve their situation, and of superseding the necessity of employing them at all, by substituting machines for that purpose. This Committee procured by subscription a sum, which, though not large, has hitherto served to defray those expenses necessarily incurred in the prosecution of the object for the attainment of which they were appointed. The Committee then procured one of the machines from Mr. Smart, and engaged a clever, active man to undertake the working of it (having first offered it to all the regular sweepers, who refused it). The Committee then endeavoured, by public and private application, to induce as many of the inhabitants as they could

could to encourage the use of the machine; in which endeavour they were as successful as could have been reasonably expected. As all the regular chimney-sweepers have endeavoured by every means in their power to impede the use of the machine, the Committee found it necessary to procure a boy to assist the man with the machine, and in cases where necessity required it to go up the chimney, because the regular chimney-sweepers refused to suffer their boys to complete the sweeping of those chimneys where the machine had failed. The brush procured from Mr. Smart being found rather difficult to work, and liable to be out of order, the Committee made, and caused to be made, many experiments for the purpose of improving it. Those of which they have sent drawings, Plate XIII. figs. No. 1. and 2. seems to them the most simple, the most easy to work, the most durable, and the most efficacious of any which they have tried or seen. The result of all the experience which the Committee have now had is, that though probably nine-tenths of the chimneys in this town, as they now are, might be swept with the machines, yet that not one in ten of those will voluntarily be permitted to be swept by them, however much the Committee may exert themselves, because it probably will always take up some more time in the operation, and there is some risk in the first instance that the chimney may not admit of being swept by the machine, and because the ordering of it is generally left to servants, indifferent to the object, and inimical to new experiments, which might cause them more trouble. It is very possible, by stating striking and recent cases of oppression and suffering, to arouse humanity to expressions of sorrow and commiseration, but not often to great and continued efforts to assist, especially if it require any sacrifices, however trivial. It therefore follows, that, unless the method of sweeping chimneys

chimneys with machines can be rendered less expensive and less inconvenient than by boys, (a thing not to be expected,) the practice will never voluntarily become so extensively adopted as to diminish in any considerable degree the number of climbing boys. The Committee are therefore decidedly of opinion, that the object which they are endeavouring to reach, can be in no other way effectually obtained than by an Act of Parliament prohibiting chimney-sweepers from taking any more climbing-apprentices, and from employing any others than apprentices as climbing-boys. The Committee are of opinion that such an Act would effectually produce the desired end, without subjecting either the public or chimney-sweepers to any very serious loss or inconvenience, because the chimney-sweepers would have an opportunity to get into the practice of using the machines, before the present apprentices were out of their servitude, and the generality of those chimneys, which now cannot be swept with the machines would be easily so altered as to render them capable of being swept with them, and all new chimneys would of course be so constructed. The Committee further feel confident, that the attention and ingenuity of able mechanics and others interested, would be so much turned to the completion of the object, that very considerable improvements in the machines, and in the manner of working them, would be very soon made. As one of the most likely methods of producing the effect, the Committee have thought it right thus candidly to state their sentiments and opinions to the Society, to whom they will be happy to give any further information in their power, which may be thought likely to conduce towards obtaining the object of which they are in pursuit. The Committee need not attempt to describe the degree of suffering, consequent deformity, great depravity, painful diseases, and frequent

loss of life, which attend the present practice to so many thousands of helpless and unoffending children, who might otherwise become happy, useful, and worthy members of the community, because the Society were fully satisfied on these points long before the Committee who now address them were called upon to assist in the endeavour to remedy them. That the Committee have not been exaggerating the capability of the machines, (imperfect as they must be admitted at present to be,) is evident from the list sent herewith of such chimneys as have been swept with them here during the first twelve months, being upwards of twelve hundred, in spite of all the prejudice, opposition, and difficulties against which they had to labour, also from the number of respectable signatures approving of and recommending, after trial, the use of the machine. For it must be recollected, that it is only amongst the more opulent inhabitants, and, consequently, in the highest and most difficult chimneys, that it has hitherto been principally used, because, amongst the lower class, the regular chimney-sweepers have been accustomed here to sweep for the soot only, a practice not yet adopted with the machine. The man employed here with the machine states, that if he had tolerable regular employment, at six pence each chimney, it would pay him very well. The Committee were very fortunate in engaging a person well qualified and active in the use of the machine, who has, under their inspection and directions, used his utmost endeavours to promote the success of the machine, both by improving and facilitating the use of it.

As it did not appear probable to the Committee that there would very soon be any great diminution made in the number of climbing-boys, they have not been inattentive to their welfare and comfort, but have endeavoured as much as was in their power to soften the rigour of their treatment,

ment, and to improve their situation. As the act for the regulation of chimney-sweepers and their apprentices was found to be so negligently drawn up, and so loosely worded, as to be utterly inadequate to enforcing proper treatment, the Committee, with the advice and co-operation of the magistrates, induced the master chimney-sweepers voluntarily to agree to certain regulations respecting the treatment and employment of their boys, which the Committee trust will be attended with considerable benefit to the poor children. The plan of having them to dine on Easter Monday, will give the Committee an opportunity of enquiry respecting the treatment which they receive, of giving them good advice, and of rewarding those who have behaved well.

I am, very respectfully,

Sir,

Your obedient servant,

SAMUEL ROBERTS,

Chairman.

Sheffield, Oct. 11, 1809.

To C. TAYLOR, M.D. SEC.

CHIMNEY-SWEEPERS.

We, the master chimney-sweepers, resident in Sheffield, whose names are underwritten, do agree to the following resolutions:

1. That we will not take any boy as an apprentice, under the age of eight years, nor will we bind any one to continue longer in servitude than he is sixteen years of age.

P 2

2. That

2. That we will not send out any boy to work before four o'clock in the morning in summer, nor before five in winter, in the town.

3. That we will not permit any boy to go out to climb a chimney after twelve o'clock at noon, nor will we suffer our apprentices, or boys employed by us, to seek work, or to be engaged in any way in our business out of doors, after five o'clock in the afternoon in summer, nor after four in winter.

4. That each boy shall have a good breakfast, before he leaves home in a morning, a good dinner between the hours of twelve and two o'clock at noon, and a good supper between the hours of five and seven o'clock in the evening.

5. That every two boys shall be allowed one good bed, with sufficient coverings, and they shall be allowed at least eight hours rest in each night.

6. That we will provide every boy with decent and sufficiently warm clothing, as a sweeping-dress, including a pair of good shoes, to be worn always when he is on duty, also a suitable cap, having a plate in front with his master's name and place of abode engraven on it.

7. That over and above the sweeping dress, we will provide for each boy a complete suit of good clothes, including linen, hat, shoes, and stockings, on every Easter Sunday, and that he shall appear in the same before "the Committee for bettering the Condition of Climbing-boys, &c." on the Monday following, between the hours of twelve and one o'clock, at the Cutlers' Hall, or some other convenient place, and shall be permitted to dine there, or elsewhere, on that day at the Committee's expense.

8. That

8. That we will not, on any occasion, lend out our boys to each other, or to any other persons in the trade.

9. That we do engage, on every Lord's day, to send our apprentices and boys employed by us to some Sunday-school approved by the aforesaid Committee, and also to divine service with the rest of the children who attend the same school.

*Sheffield, Cutlers' Hall,
March 24, 1809.*

Witness, SAMUEL ROBERTS,

T. A. WARD,

G. BENNET,

W. YOUNGE,

C. PUKSLAY,

J. MONTGOMERY,

MICHAEL MELLON, his X mark,

GEORGE RIPPON, his X mark,

WILLIAM PEARS, his X mark,

JOHN RODGERS,

JOHN BETTS.

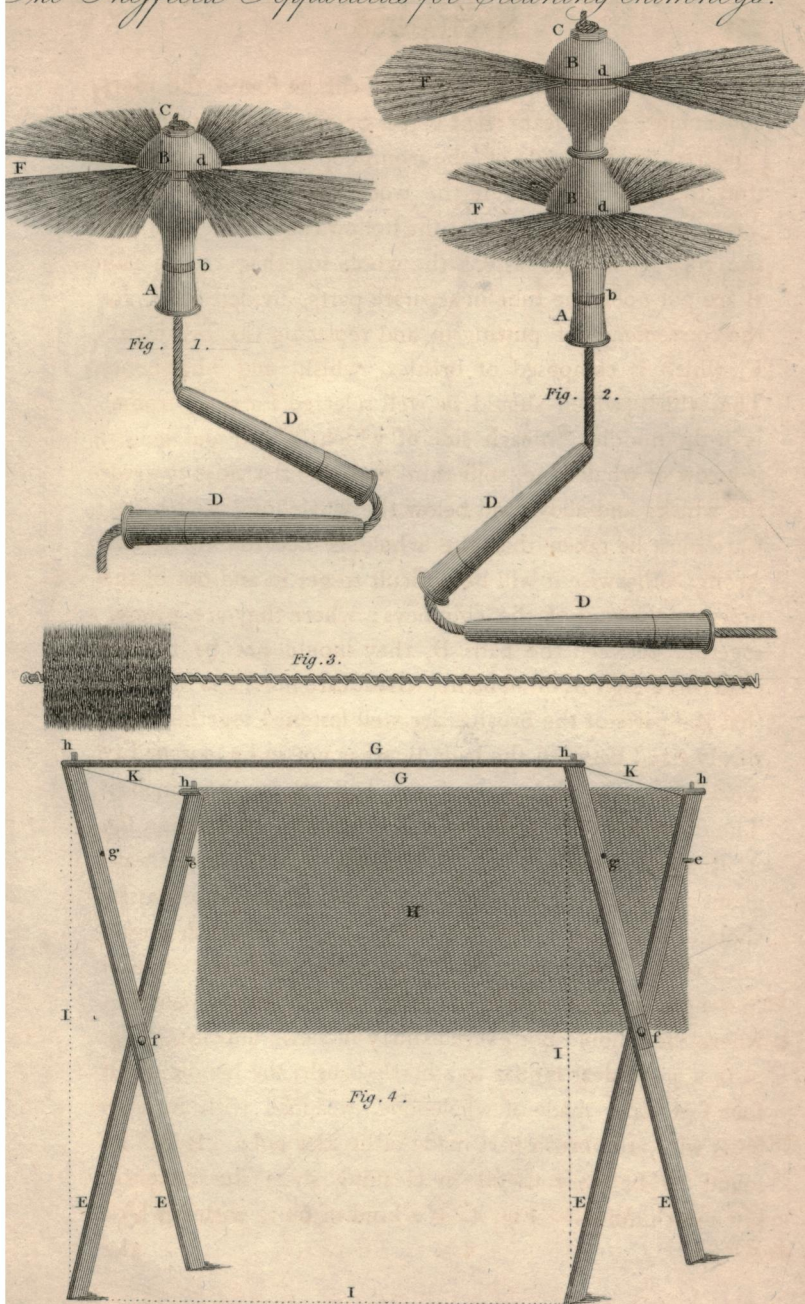
*Reference to the Engraving of the Apparatus used at
Sheffield for cleansing Chimneys without the Aid
of Climbing-boys. Plate XIII. Fig. 1, 2, 3, 4.*

The two brushes, fig. 1. and 2. are those which at present appear to answer best the intended purpose. Fig: 1. is the easiest to work in difficult chimneys, but in those

which are tolerably straight No. 2. will be found the more convenient, as it clears itself better of the soot in ascending. Soldered on the inside of the iron hoop A, at *b* is a hollow iron tube, going through the wood balls B. The nut C screws upon the upper end of the hollow tube, through which the rope passes and fastens the whole together. The balls B are put upon the tube in separate parts, divided at *d*, for the conveniency of putting in and replacing the brush part F, which is composed of bristles, whisk, and whalebone. The whisk (which should be well selected for the purpose) is in the middle, on each side of which, above and below, is a row of whalebone, split thin, with the flat sides towards the whisk, and above and below the whalebone are bristles. Care must be taken that the whole is not too thick and strong, otherwise it will be difficult to get in and out of the pipes on the tops of the chimneys; where they are pressed together between the balls B, they should not be thicker than three-eighths of an inch. Great care must also be taken that the parts of the brushes are well fastened together, and firmly fixed between the balls B, so as not to be loosened in working. The diameter of the balls B is three inches. The distance between the two brushes F F, in drawing fig. 2. is about four inches. The wood tubes D, (which are about one inch in diameter,) through which the rope passes, should not be too long; the shortest next the brush should not exceed fifteen inches. They should gradually increase in length as they recede from the brush to the bottom, where they should not exceed thirty inches. The brush, fig. 3. is a good deal similar to a bottle-brush, the handle about four feet long, made of whalebone, wrapped with iron or brass wire, the brush part made of bristles only. It will be found to be very useful in cleaning short flues, &c. in kitchen-chimneys. Fig. 4, is a kind of tent, within which
the

The Sheffield Apparatus for Cleaning Chimneys. PL. 13.

Pl. 13.



Engraved by S. Porter.

the machine may be worked. It will be found useful in rooms, where it is particularly desirable, to prevent the least particle of soot from escaping. The cross bars E are of oak, about one inch and a half broad, and half an inch thick, turning upon an iron pin at *f*. G G are two small iron rods, slipping upon pegs at *h*, to each of which is suspended a linen curtain, the one next the chimney H, a short one, the other as shown by the dotted line I, a long one, reaching to and resting five or six inches upon the floor. *ee* are small pegs, which when the bars E are closed, fit into the notches *gg*, so as to stop the bars in the proper place, and prevent their being opened the wrong way. When the bars E are opened, they stretch the tapes K, which are fastened to the tops of the bars at *h*, and are about three feet six inches long, to which extent only they suffer the bars to open. When thus extended, and placed in the proper situation, a loose sheet, of the same kind of linen as the curtains, is thrown over, and hangs down over the tapes and upon the floor at each end, buttoning to the curtains at the corners, so as to form a complete tent, about five feet long, four feet wide, and five feet high, within which both the man and the boy can stand with the machine to work it.

